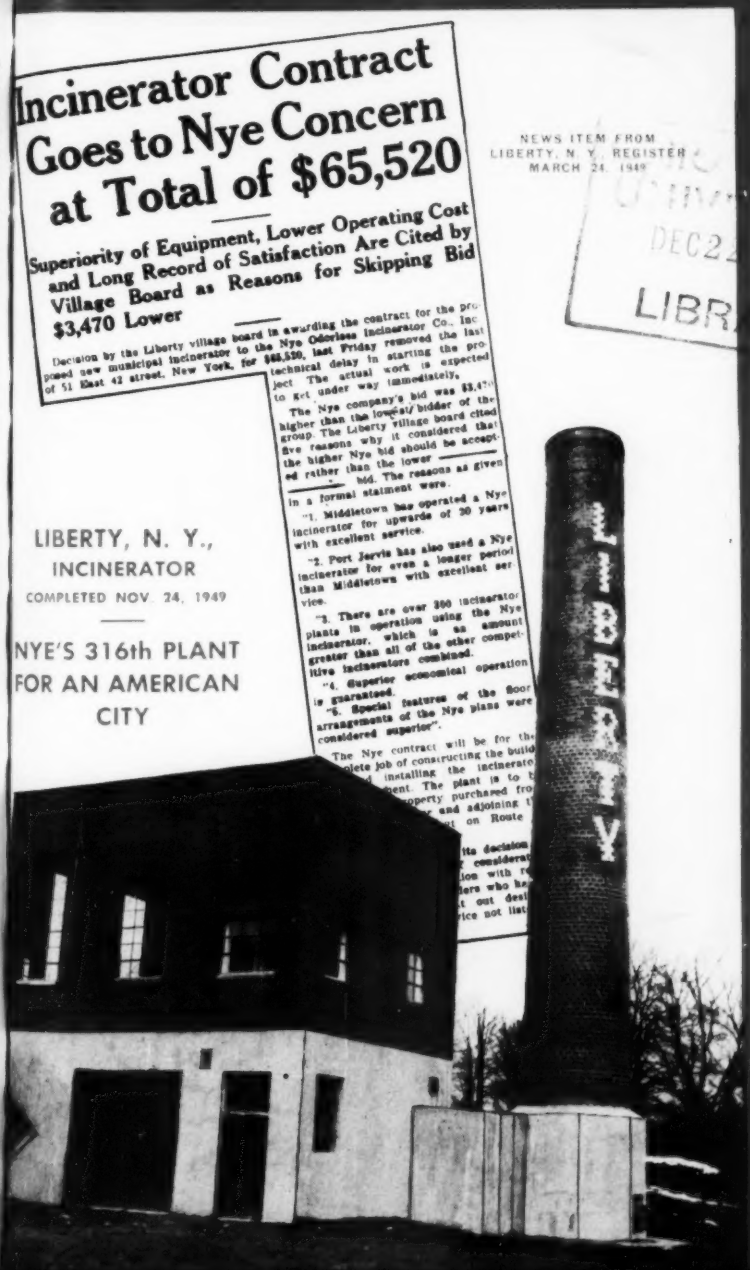
PUBLIC WORKS

city county and state

december 1949


Incinerator Contract Goes to Nye Concern at Total of $65,520
Superiority of Equipment, Lower Operating Cost and Long Record of Satisfaction Are Cited by Village Board as Reasons for Skipping Bid $3,470 Lower
NEWS ITEM FROM LIBERTY, N. Y., REGISTER MARCH 24, 1949
LIBERTY, N. Y., INCINERATOR
COMPLETED NOV. 24, 1949
NYE'S 316th PLANT FOR AN AMERICAN CITY

STATE UNIVERSITY DEC 22 1949 LIBRARY

some of the articles in this issue:

Highway Capacity Determination

★

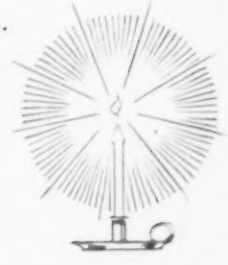
Vacuum Filtration of Sludge

★

Consulting Engineers Report on Work

★

How and When to Use Wire Rope



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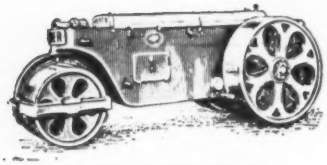
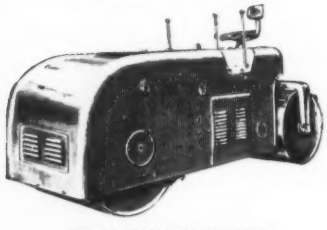
how?

USE THE HUBER MAINTAINER

On Jobs Now Tying Up Big Equipment



HUBER 3-WHEEL ROLLERS
4 models—5 to 12 tons



HUBER TANDEM ROLLERS
5 models—3 to 14 tons

Put the versatile Huber Maintainer to work on your new construction or maintenance program. It will "pay off" by doing cheaper and faster the many odd jobs and maintenance work now tying up heavy equipment. It's a money maker in its own right—ideal for road, street and airport construction and upkeep. With its 42½ H.P. engine and 20 miles per hour speed the Maintainer really covers the job. With its hydraulically operated attachments it is readily converted to a bulldozer, patch roller, rotary broom, lift-loader, snow plow, berm leveler, road planer or mower. Ask any Huber owner about the Maintainer—he'll vouch for its dependability, long life and all-'round performance.

Other Huber road machinery built to make your construction work more profitable includes: 3-wheel automotive type road rollers, tandem rollers and trench rollers. Write today for descriptive bulletins and name of your Huber dealer.

HUBER

THE HUBER MFG. COMPANY
Marion, Ohio, U.S.A.

HUBER

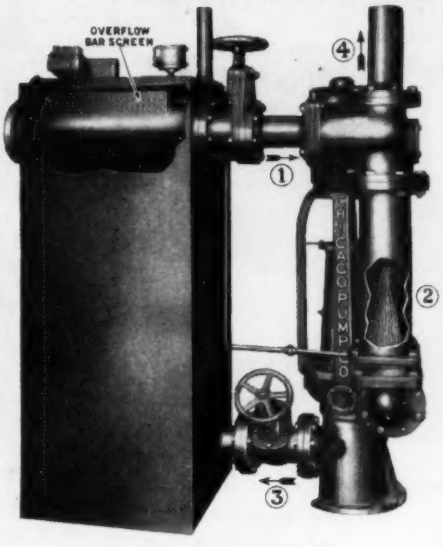
3 Wheel • Tandem
ROAD ROLLERS
and
MAINTAINERS

"CHICAGO" PUMPS
FOR SEWAGE AND SLUDGE

FLUSH KLEEN EJECTORS FOR SEWAGE

"Flush Kleen" pumps provide automatic, trouble-free service in sewage lift-stations. They require no manual attention except periodic lubrication and inspection. No labor is required for disassembling and cleaning clogged pumps as with other types.

The impellers handle only strained sewage. No solids pass through the impeller to cause excessive strain and wear on impeller, shaft, bearings or motor; pumps remain in balance and operate economically with little attention.

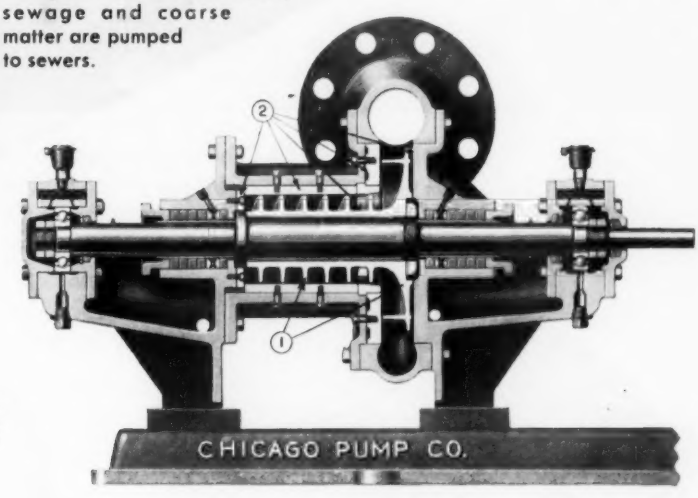


Filling Wet Well

1. Sewage flows through inlet pipe.
2. Coarse matter is retained on strainer.
3. Strained sewage flows through idle pump to wet well.

Pumping

3. Strained sewage is pumped from wet well.
2. Coarse matter is backwashed from strainer.
4. Special check valve closes; sewage and coarse matter are pumped to sewers.



SCRU-PELLER PUMPS FOR SLUDGE

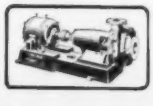
The Scru-Peller Pump was specifically designed to handle sludge. Coarse, stringy material is cut and cannot wrap or bind the impellers.

1 SCREW and IMPELLER are keyed on the shaft and held firmly against a shoulder on the shaft by a nut. The screw has two flights; and the impeller has two blades. Each flight in the conveyor connects directly with its own blade of the impeller.

2 CUTTING EDGES. There are four cutting bars and a cutting ring in the screw housing and four cutting bars in the pump casing. The cutting takes place between the edges of the screw and the cutting edges in the screw housing, between the edges of the impeller blades and the cutting edges in front of the impeller, and between the edges of the impeller blades on the back of the impeller and the cutting edges of the pump casing.

CHICAGO PUMP COMPANY
SEWAGE EQUIPMENT DIVISION

2348 WOLFRAM STREET — **CHICAGO 18, ILLINOIS**



Flush Kleen, Scru-Peller, Plunger, Horizontal and Vertical Non-Clogs Water Seal Pumping Units, Samplers, Swing Diffusers, Stationary Diffusers, Mechanical Aerators, Combination Aerator-Clarifiers, Comminutors.

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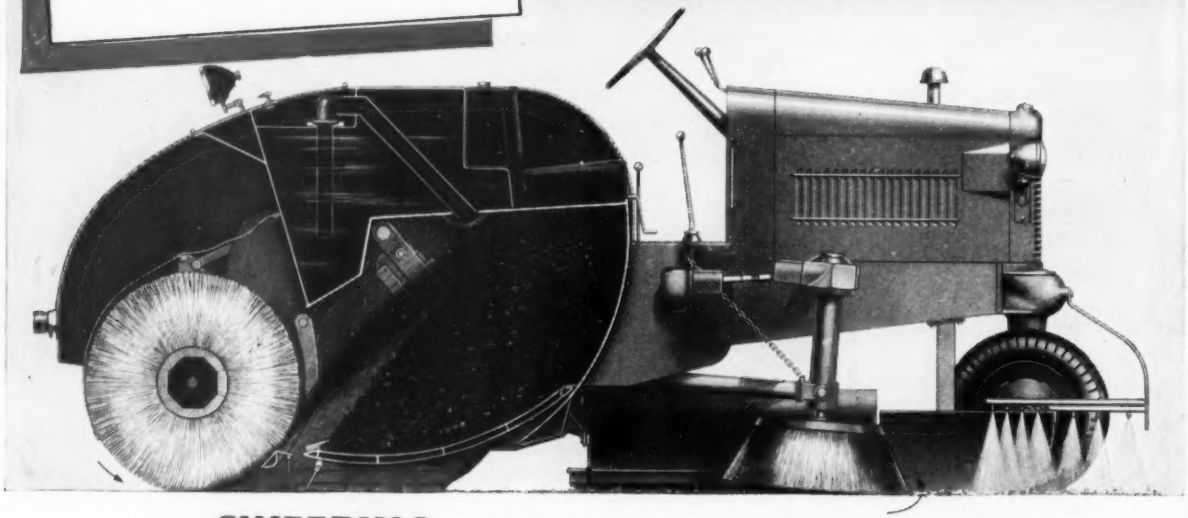
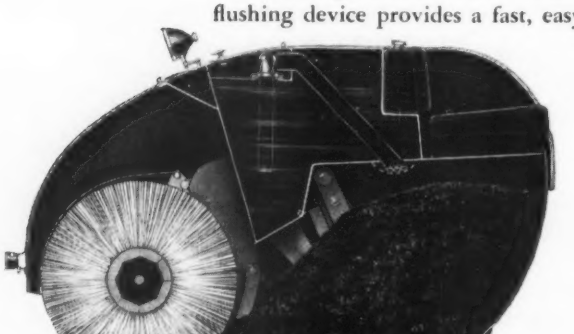
MODEL
40
MOTOR SWEEPER

the Inside Story

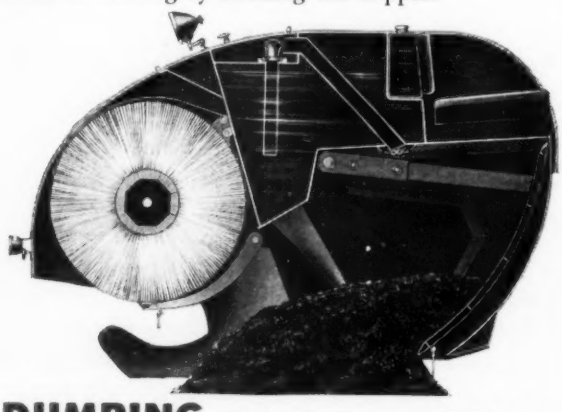
of exclusive features which save time and money, and increase all-around operating efficiency.



SWEEPING. There is no expensive elevator or conveyor in the Model "40"—no complicated, troublesome mechanism to repair and maintain. The rear broom sweeps dirt and refuse directly into the 2-cubic-yard hopper. A built-in flushing device provides a fast, easy method of thoroughly cleaning the hopper.



CARRYING. Broom and drag wings lift automatically as hopper gate moves back into rear broom by finger-tip hydraulic control. Rear broom forms leakproof tail gate, closing hopper for transporting.



DUMPING. Hydraulically-controlled hopper gate moves up for fast, clean dumping. The Model "40" dumps, and resumes sweeping in less than one minute, without backing, or leaving the path of travel.

AUSTIN-WESTERN COMPANY, AURORA, ILLINOIS, U. S. A.

BUILDERS OF ROAD MACHINERY
Austin Western
SINCE 1859

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Public Works

THE ENGINEERING AUTHORITY IN THE CITY-COUNTY FIELD

Edited by
W. A. HARDENBERGH and A. PRESCOTT FOLWELL

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Don't let High Costs Sabotage your Sewer Budget

It's true that material and labor costs are higher, but they need not undermine your sewer budget. You can make substantial savings on material costs in larger sizes by using ARMCO Sewer Pipe. Even better, you can save up to 25 per cent of labor costs. This is how it is done . . . .

ARMCO Corrugated Metal Pipe is light in weight, easy to haul and handle, using only ropes and plank skids. Long lengths mean fewer joints — less assembly — faster installation. No special foundations are required and no time is lost in curing. Unskilled labor quickly makes tight joints with simple band couplers. On extra large sewers sturdy, prefabricated MULTI-PLATE Sections are delivered to the site ready for speedy, low-cost installation.

You will also find other advantages in ARMCO Sewer Structures. Install them under railways and highways without worry of breakage or loading failures. There is a size and type for every purpose. ARMCO PAVED-INVERT Pipe combats erosion. ASBESTOS-BONDED Pipe provides all the durability you will ever need. Where headroom is limited ARMCO PIPE-ARCH saves time and labor.

An ARMCO Engineer will be glad to demonstrate how you can save time and money on your specific problems. Ask him about ARMCO Sewer Structures before figuring that next job. Armco Drainage & Metal Products, Inc., 855 Curtis Street, Middletown, Ohio. Export: The Armco International Corp.

ARMCO

ARMCO SEWERAGE PRODUCTS

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THE EDITOR'S PAGE

1950

Soon after this issue of PUBLIC WORKS reaches it readers, another year will have passed. For 1950, we wish to all a happy and prosperous year, and a year of accomplishment, as well. We wish for engineers larger responsibilities and fuller participation in the daily affairs of the community, the state and the nation. We wish for them a recognition of their great abilities, and adequate rewards in return. We wish them to have a sounder appreciation of their own abilities and a willingness to accept the responsibilities that are inherent in those abilities.

In the ten years that have just passed, engineers have written their accomplishments indelibly on all the continents of the world. They hacked great airports out of rock, or built them on mud or sand, or whatever they found; they built roads where none believed roads could be built; they served pure water to our soldiers all over the world; they conquered malaria, the age-old scourge of the tropics; they were in the forefront of every battle.

All these they did, and much more. They showed how true was that motto: "The difficult we do at once; the impossible takes a little longer." Nothing could stop them for long. If they now apply to the problems of civilian life that unflagging energy and determination, that willingness to take responsibility, and that magnificent leadership which the war days showed they had in such great measure, they can contribute greatly in these days to the welfare of the nation.

Keeping Trash Off Roadsides

Most everyone agrees that the practice of dumping trash along roadsides is a highly reprehensible one; but little is being done in a constructive way to prevent it. Today there are a good many built-up suburban areas where there is no functioning local government and, therefore, no provision for collection and proper disposal of garbage and refuse. So, before complaining too bitterly about the trash-dumping practice, we might ask "What should people living in such areas do with their refuse?"

There are two possible courses, and maybe more. First, the State Departments of Health should take the lead in promoting legislation that will permit proper collection and disposal of waste materials in such suburban areas; or they should take the lead in negotiating with adjoining communities for collection. Second, the overall community, which will usually be the county or township, may well establish small sanitary fills at convenient places along county roads where the householders can dispose properly of their wastes. One southern county, at least, has taken the lead in such work by providing a number of sanitary fills along its roadsides. Properly designed and located at suitable places, such fills can be kept relatively sanitary at an exceedingly small cost; and they will certainly add to the healthfulness of the community, and indirectly to its attractiveness by doing away with a considerable portion, at least, of roadside trash dumping.

Sewerage, Sewage Treatment and Municipal Debt Limits

Many communities are either unable or unwilling to finance sewer systems and sewage treatment plants because of legal restrictions on the amount of debt that can be incurred. Some communities are distressed over the circumstance and wish to do their part in the reduction of stream pollution. Others, it is suspected, are utilizing these restrictions as an excuse for doing nothing; in fact, in many states, they are practically law-proof as far as action by the State Department of Health is concerned.

In those states where authorization does not already exist for doing so, a constitutional amendment should be adopted permitting cities to incur debt in excess of the legal limit for self-liquidating public works, such as sewers and sewage treatment financed from sewer rentals. A legal debt limit is a fine thing, but it should not apply to prevent construction which the public health, convenience and good neighborliness demand.

Better Records Are Essential for Refuse Operations

Relatively few cities maintain reliable data on the cost of collecting and disposing of garbage and refuse. Still fewer keep accurate records of volumes and weights of refuse collected. This is in sharp contrast to the records that are maintained on most other municipal operations, including, in the public works field, street construction and maintenance, water works operation and sewage treatment.

The proper and timely collection and disposal of refuse is highly important in respect to health. Improper refuse collection and disposal may not be so quick to react on the public health as is impure water, or even improper sewage disposal; but its long term effects are nearly as important. The time is past when slipshod methods can be justified. Adequate and sanitary collection and disposal are essential, and reliable financial and operating records are equally necessary if this important public utility is to be operated with the efficiency and economy which its importance demands.

They believe that better refuse disposal, utilizing modern collection equipment and disposal methods, is one of the two or three most important public health engineering problems in this country today.

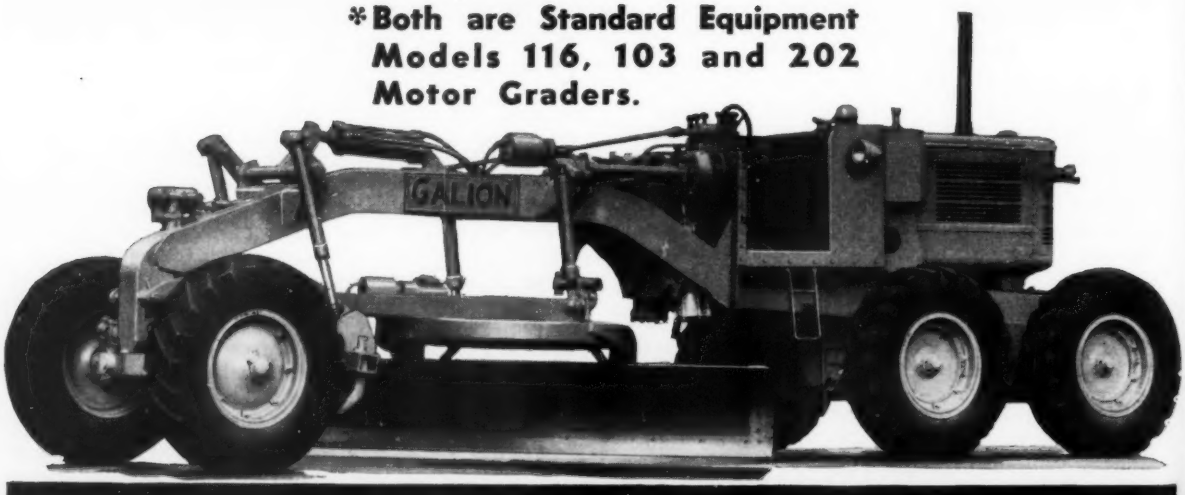
Why take less for your money?

You need both-

* LARGE FRONT TIRES

* HYDRAULIC BOOSTER STEERING

*Both are Standard Equipment
Models 116, 103 and 202
Motor Graders.



SAME SIZE TIRES FRONT AND REAR

THE GALION IRON WORKS & MFG. CO., General and Export Offices — Galion, Ohio, U. S. A.
Cable address: GALIONIRON, Galion, Ohio

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When the going is the toughest you really need that confident — "FEEL OF HAND STEERING" while the hydraulic power is doing the "BIG MUSCLE" part of the steering job —

Ask any operator who is using a new GALION. Then ask yourself —

Why take less for your money!

GALION

HYDRAULIC BOOSTER STEERING MOTOR GRADERS

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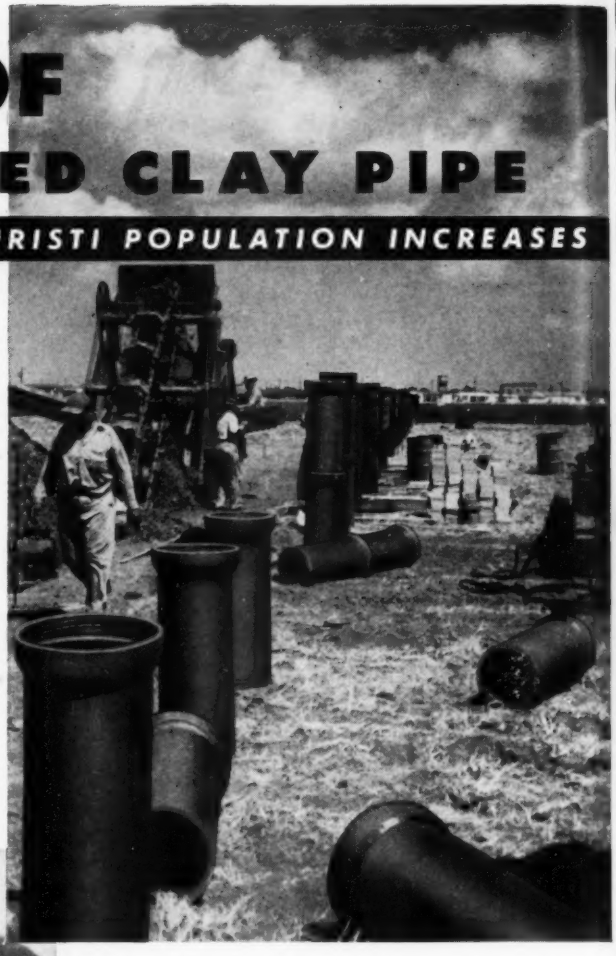
37 MILES OF VITRIFIED CLAY PIPE

HANDLES CORPUS CHRISTI POPULATION INCREASES



BELOW SEA LEVEL INSTALLATION

The project, designed and supervised by city engineers under the direction of H. H. Stirman, Public Works Director, and R. L. Otto, Head of the Engineering and Construction Division, drains and sewers Corpus Christi's Lindale Park development of 1200 new homes. It calls for 194,688 feet of Vitrified Clay Pipe ranging in size from 8 to 24 inches in diameter. Vitrified Clay Pipe was specified to resist corrosion from perpetually saturated and strongly electrolytic soil.

NO FOREIGN MATERIAL IN VITRIFIED CLAY PIPE

Vitrified Clay Pipe is not a compound or mixture of materials bonded by chemical agents. It is pure, natural clay fused at high temperatures by an exclusive process called *Vitrification.* Clay Pipe is a permanent, *heat-bonded* material that serves indefinitely without wearing out. Vitrification is the reason why Clay Pipe is acid-proof, rust-proof and cannot crumble or deteriorate.

If You Need Specific Information On A Clay Pipe Question, Write The Details To The Office Nearest You.

NATIONAL CLAY PIPE MANUFACTURERS, INC.

100 North LaSalle St., Room 2100, Chicago 2, Ill.
206 Connally Bldg., Atlanta 3, Ga.
703 Ninth and Hill Bldg., Los Angeles 15, Calif.
1105 Huntington Bank Bldg., Columbus 15, Ohio

Vitrified

CLAY PIPE NEVER WEARS OUT! PIPE

C-149-1

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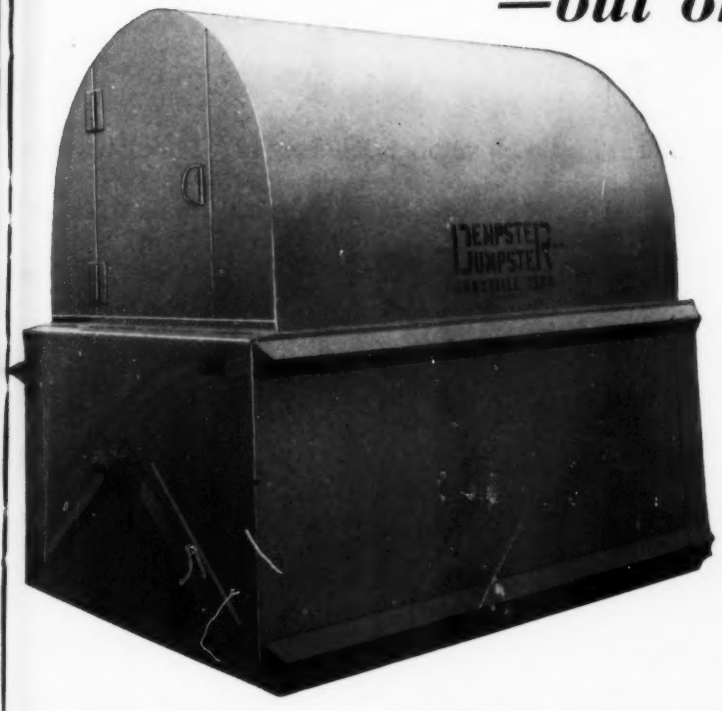
Dozens of Containers

—but only One Truck



It's the
Dempster-Dumpster
System
for Bulk Rubbish
Collection at the
Lowest Possible Cost!

In comparison with the conventional truck method of bulk rubbish collection, the Dempster-Dumpster System is simple, far more economical and efficient. It assures exacting sanitary conditions and wins the enthusiastic support of the people.

Minimum investment in rolling equipment is a major advantage. The Dempster-Dumpster System comprises a single truck hoisting unit which serves any number of containers, up to 10 cu. yd. capacity. Various designs are available to handle moist or dry materials. Containers are placed at convenient locations in business districts, housing sections, apartments, schools . . . wherever bulk rubbish accumulates. The Dempster-Dumpster Truck Hoisting Unit makes scheduled rounds, picks up each full container, hauls it, dumps it, and returns it. All containers are rat proof, fly proof, fire proof. Wind or scavengers cannot scatter trash. All of which are important to sanitation and public safety.

Shown at right are the three simple steps in handling a container—pick-up, hauling, and dumping. One man, the driver, handles the entire operation by hydraulic controls in the cab. The Dempster-Dumpster System is a complete, unified plan for bulk rubbish collection. A system, which, because of its tremendous savings, no town or city can afford to do without. Write today for complete information.

DEMPSTER DUMPSTER
TRADE MARK REG.

DEMPSTER BROTHERS, Inc.

9129 DEMPSTER BLDG. KNOXVILLE 17, TENN.

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Why do taxpayers

Our advertisement in the November 7th issue of "Time" had this headline: Taxpayers *love that pipe!* We then went on to tell "Time's" 4½ million readers that "cast iron pipe has saved, and is now saving, millions of tax dollars because of its long life."

How were we justified in making that statement? This is how! The public has an important stake in the economical operation of water supply, gas distribution and sewerage systems as reflected in taxes, or assessments or rates (taxes in another form). By avoided replacements of mains, which would have been necessary with shorter-lived pipe, cast iron pipe has saved the public many millions of dollars in direct or indirect taxes. Generations after the bonds, issued to pay for the mains, have been retired and forgotten, cast iron mains will still be in service. Ask the 30 cities in the United States and Canada that have cast iron water or gas mains in service that were installed from 100 to 130 years ago!

96%

OF ALL 6-INCH AND LARGER CAST IRON WATER MAINS EVER LAID IN 25 REPRESENTATIVE CITIES ARE STILL IN SERVICE.

Based on the findings of a survey conducted by leading water works engineers.

Cast Iron Pipe Research Association,
T. F. Wolfe, Engineer, 122 So. Michigan Ave., Chicago 3.

CAST IRON PIPE

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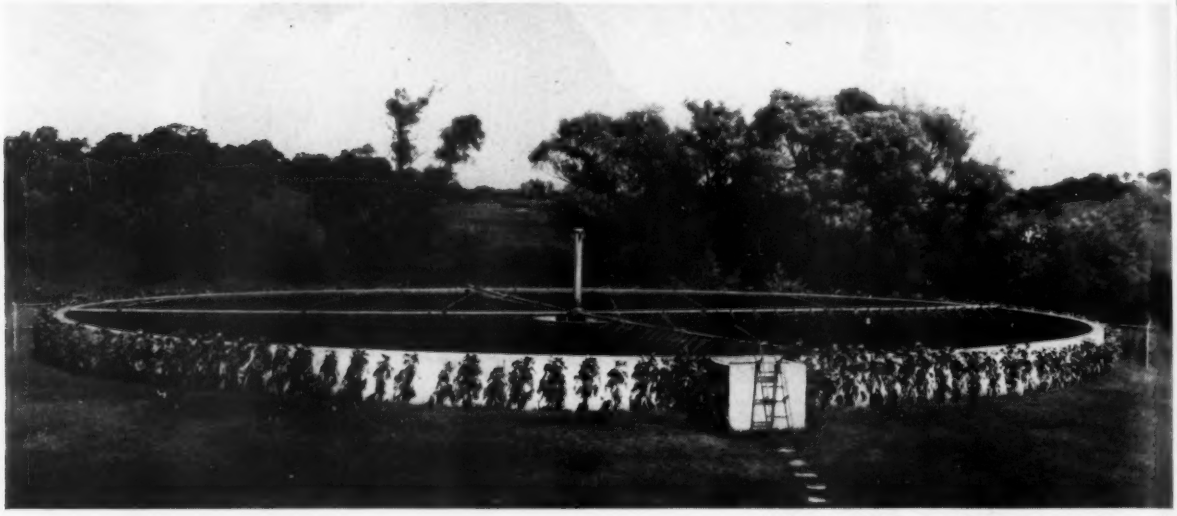
"love that pipe"?

SERVES FOR CENTURIES

TODAY'S FILTER PLANTS use *vitrified clay filter bottom blocks*



Designed by: W. E. Deutchler, Cons. Engr., Aurora, Ill.

INFILCO'S Accelo Filter Does Fine Job for Lake Geneva

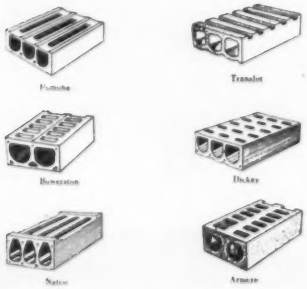
This filter at Lake Geneva, Wisconsin, is arranged so the city can take advantage of INFILCO'S Accelo filter system that involves direct recirculation of filter effluent back to the filter influent. The plant has been operated in this manner on one or two occasions. This filter is 100' in diameter and when operated with direct recirculation has a filter dosage rate of 4.5 million gallons per acre per day including the quantity recirculated.

When operated in this manner over a 24 hour period 79% reduction in 5 day BOD was obtained and 89% reduction in suspended solids. During the filter run the organic loading on the filter was 0.39 lbs. of BOD per cubic yard of filter media.

Whether your next job is an Accelo filter, or another type, you can insure best results by specifying *Vitrified Clay Filter Bottom Blocks.* Made by members of the Trickling Filter Floor Institute, these blocks are scientifically designed to provide the proper ventilation and drainage needed for best operation. For complete details write any member of the Institute.

Note these special advantages of Vitrified Clay Filter Bottom Blocks:

RESIST ACIDS
PROVED BY USE
EASY TO LAY
WON'T CLOG



TRICKLING FILTER FLOOR INSTITUTE

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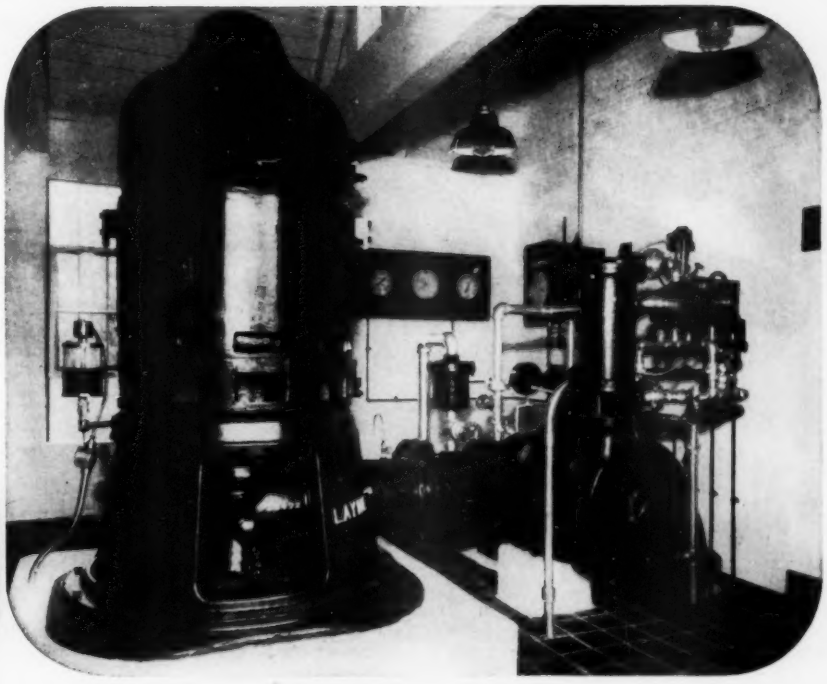
"Better Built—
for Better Service"



ABOUT DISCARDING OLD PUMPS

Your old, worn out and expensive to operate pumps can be replaced with the famous Layne Vertical Turbines to obtain a greater volume of water at substantially lower operating cost. Sizes range from 40 to 16,000 gallons per minute. Drives may be by electric motor, gas, gasoline, Diesel or steam engine—or by steam turbine. Send for the Layne Vertical Turbine Pump catalog.

WHAT'S SO IMPORTANT ABOUT HIGH EFFICIENCY

High efficiency is the one and only feature that can keep water system operation cost low—and profitable. Layne can claim the highest of all on today's market. Certainly no other is backed up by so many years of skillful engineering and advanced design. Nor is there any other that has finer quality of materials or more ruggedness of construction;—none that consistently give so many years of highly satisfactory service.

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Cities, towns, counties and states from coast to coast and border to gulf find Internationals the bonus-paying tractors for heavy work. ● *Reduced operating costs.* Extra power at the moment a load demands it. *Quick starting regardless of weather.* Perfect balance and stability with equipment matched to it for every kind of tractor job. *These are some of the advantages International diesel crawlers offer.*

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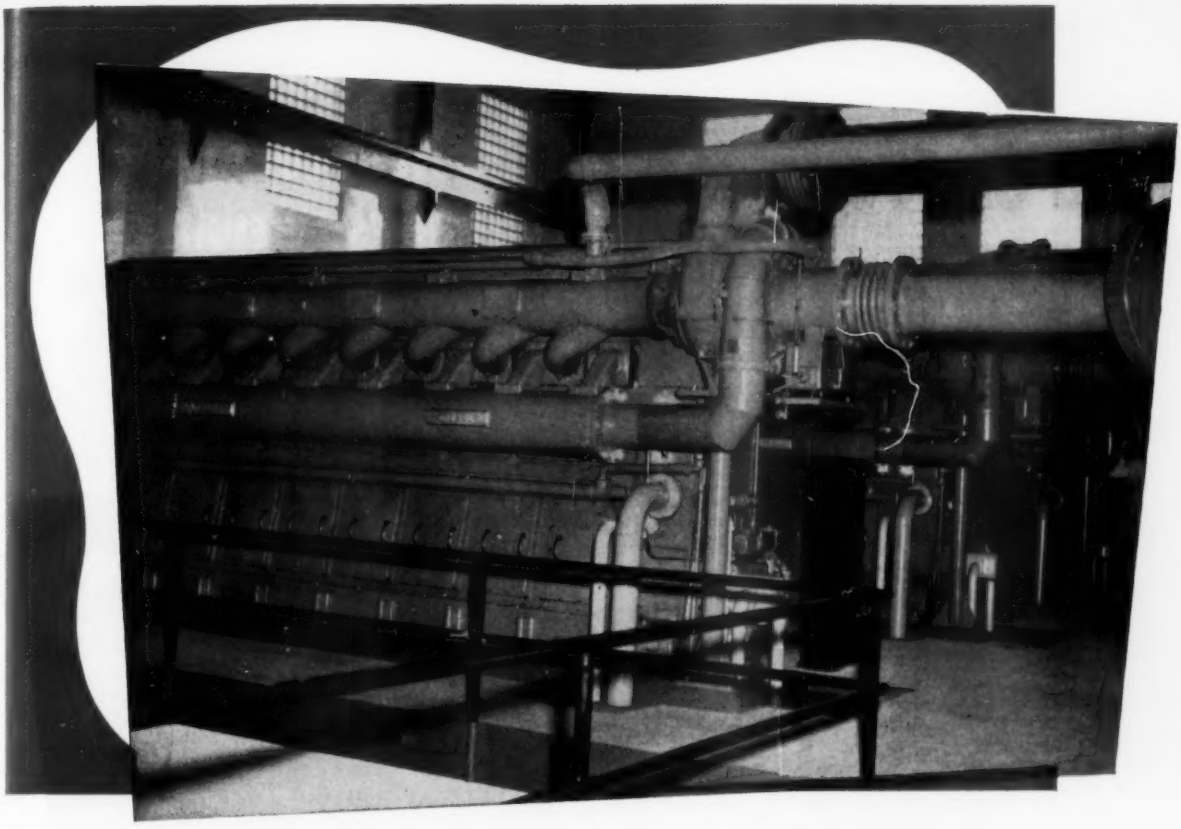

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1949

★★★★★★ SIX NEW STAR PERFORMERS

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NEVER HAVE SO MANY NEW UNITS OF THIS TYPE BEEN INTRODUCED BY ONE ROAD MACHINERY MANUFACTURER IN SO SHORT A TIME . . . .

Four New Motor Graders

Now a Size to Fit Every Job and Budget!

★ **AD-4** 22,140 lbs. . . . 104 brake hp. . . . GM 2-cycle diesel engine.

★ **BD-3** 19,042 lbs. . . . 78 brake hp. . . . GM 2-cycle diesel engine.

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★ **MODEL D** 8,500 lbs. . . . 34.7 brake hp. . . . Allis-Chalmers gasoline engine. A completely new low-cost motor grader with *exclusive* tandem drive. Engineered new from the ground up to bring you BIG grader design and performance advantages.

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★ **HD-19** With *exclusive* torque converter drive! Load and speed automatically balanced — up to 25% more work on many applications. Weighs 40,000 lbs. 163 hp. GM 2-cycle diesel engine.

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These two new units, along with the widely used HD-7 and HD-10 tractors, complete the Allis-Chalmers crawler line.

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Originator of the Torque Coverter Tractor

Here's how TRANSITE PRESSURE PIPE meets these 7 basic water-line problems . . .

IF YOU are faced with some—or all—of these 7 common water-line problems, here is information about Johns-Manville Transite* Pressure Pipe that may be of help to you . . . facts that tell how this modern asbestos-cement pipe is helping to solve these problems in many communities.

1. Handling costs:

Because it is light in weight and easy to handle, Transite Pressure Pipe keeps handling costs down. Loading, unloading, and all other subsequent handling operations are simplified. More footage can be hauled per truckload—reducing trucking costs—and distribution along the trench is easier and more quickly accomplished. Moreover, mechanical handling equipment is not necessary except where larger sizes are being used; the pipe sections are easily lowered into the trench with rope slings.

2. Installation costs:

Transite Pressure Pipe offers important economies that help combat increasing costs of water-line installation. It is quickly and easily assembled in the trench. A coupling puller is the only tool necessary. Often, the pipe can be assembled so rapidly that the same foreman supervises both excavation and installation. The speed with which Transite is assembled means that the job is completed with a minimum of time and labor, thereby contributing important reductions in the overall cost of the system.

*Transite is a Johns-Manville registered trade mark

When you need special information—consult READERS' SERVICE DEPT. on pages 69-73.

3. Soil corrosion:

Two factors give Transite Pressure Pipe exceptional resistance to corrosion: (1) the corrosion-resistant materials of which it is made; (2) the especially developed Johns-Manville process of manufacture which imparts a high degree of chemical stability to the finished pipe. This high resistance to corrosion has been substantiated by numerous installations. Many of these are serving as replacements in soils so destructive that the useful life of the pipe materials previously used had been seriously curtailed.

4. Internal corrosion:

Transite Pipe, because of its asbestos-cement composition, is not affected by tuberculation. Therefore, it is not necessary to resort to pipe of larger diameter to offset the internal effects of this costly form of pipe corrosion. And because progressive reduction of delivery due to tuberculation capacity is never a problem in a Transite pipe line, pressures and flows remain high—pumps operate at higher efficiencies. These factors are often reflected in better service and lower water rates in communities served by Transite lines.

5. Joint leakage:

Transite's Simplex Coupling was designed to minimize underground leakage . . . and to provide maximum protection against failures resulting from trouble at joints. It consists of only three parts: a Transite sleeve, machined to fit over the pipe ends, and two rubber rings which, when assembled, are tightly compressed between pipe and sleeve. The joint thus formed is tight and flexible. It remains tight in service. Furthermore, each joint may be checked for proper assembly immediately upon completion.

6. Vibration and stresses:

Transite's flexible joints effectively absorb the vibration of heavy traffic—an especially important factor where pipe is laid under busy highways, or near railroad and street car tracks. Because each joint is capable of deflection up to five degrees, the entire line has a flexibility not ordinarily found in other types of waterline construction. This helps compensate for soil movements and other stresses to which the pipe may be subjected . . . provides an effective safeguard against costly pipe failures.

7. Maintenance:

In thousands of communities, Transite Pipe—with its advantages of joints that remain tight and flexible, its corrosion resistance, and immunity to tuberculation—provides low-cost water transportation that requires little, if any, maintenance. Transite lines do not have to be cleaned, lined, or replaced because tuberculation has reduced their original capacity. Reports from communities all over the country prove that Transite's asbestos-cement structure provides economies that continue through the years.

If you would like additional information about Transite Pressure Pipe, write to Johns-Manville, Box 290, New York 16, N.Y. Ask for Brochure TR-11A.

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KEEP TRAFFIC MOVING EVERY DAY THIS WINTER AT ½ THE COST

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Get "Bare-Pavement" Maintenance With STERLING Auger-Action ROCK SALT

ACTUAL COSTS OF PROTECTING ICY HIGHWAYS WITH TREATED SAND OR STRAIGHT ROCK SALT

Obtained from F. Ray Williams, Supt. of Highways, Saratoga County, N.Y.

SAND MIXED WITH ROCK SALT:

Royalty	$ .10
Loading	.25
Haul, 5 miles at 8¢	.40
Piling with bulldozer	.15
Treating with salt at 50 lbs. per cu. yd.	.48
Reloading at time of storm	.25
Average haul, 10 miles at 8¢	.80
Spread	.10
Total cost per cu. yd.	$ 2.53
Use of 3 cu. yd. per mile at $2.53	7.59

STRAIGHT ROCK SALT:

CC Grade Rock Salt: (400 lb. per mile, computed for 5-ton load)

5 tons of bulk salt at $12.95 per ton	$64.75
Loading, 5 tons at 25¢ per ton	1.25
Average haul (30 miles at 8¢ per ton-mile) 5 tons	12.00
Spread (mechanical) 5 tons at $1.00	5.00
	$83.00
$83.00/5 ton per ton =	16.60
$83.00/25 miles per mile =	3.32

UNIT SAVINGS:

$7.59 cost per mile with treated sand

3.32 cost per mile with Sterling Rock Salt

$4.27 SAVING PER MILE EACH ICING IN FAVOR OF ROCK SALT

Mileage of state highways in Saratoga County, N. Y. = 216 miles

ESTIMATED SAVING EACH STORM = 216 x $4.27 = $922.32

SAFE

Sterling *Auger-Action* Rock Salt will not harm black top or brick pavements. NOR WILL IT HARM CONCRETE SLAB FOUR OR MORE YEARS OLD, NOR AIR-ENTRAINED CEMENT.*

**Authority: Portland Cement Association*

FAST

One truck of Sterling *Auger-Action* Rock Salt will cover 10-15 miles before reloading. One truck with abrasives will cover only 1½ miles before reloading. THUS SALT IS APPLIED IN 1/10th THE TIME OF ABRASIVES.

EASY

Sterling *Auger-Action* Rock Salt is easy to store. It can be used in any mechanical spreader. No vari-sized chunks. No freezing. LEAVES NO RESIDUE TO BE CLEARED FROM ROADS AND SEWERS!

ORDER STERLING AUGER ACTION ROCK SALT NOW!

Comes in carloads, bulk, and handy 100-lb. bags.

INTERNATIONAL SALT COMPANY, INC.

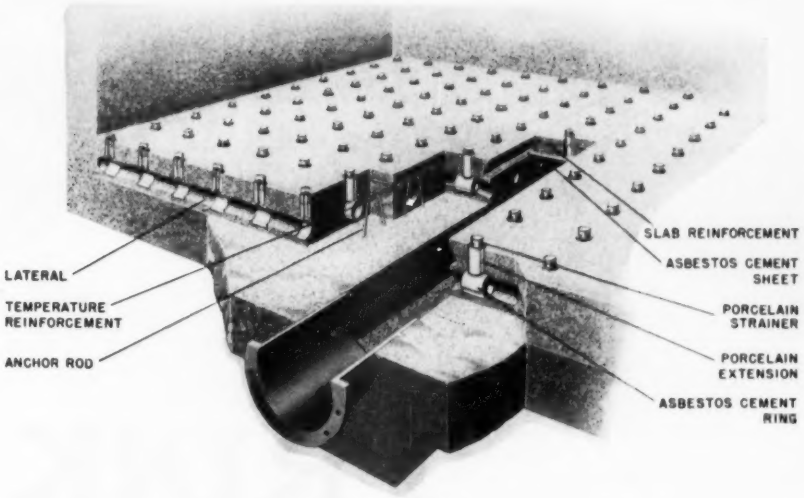
SCRANTON, PA.

When you need special information—consult READERS' SERVICE DEPT. *on pages 69-73.*

Attention— All gravity filter Plant Engineers!

THE NEW PERMUTIT® MONOCRETE UNDERDRAIN

Easy to install... non-corrodible!



Check these Advantages:

- **All parts of the underdrain are non-corrodible.**
- **All strainers are located in the same horizontal plane.**
- **Large laterals and header assure uniform collection and distribution of water.**
- **Strainers are uniformly spaced regardless of filter dimensions.**
- **Inexpensive and easily constructed.**
- **The monolithic construction is rigid and rugged.**

The Permutit Monocrete Underdrain is of monolithic construction, the header and laterals consisting of conduits cast in concrete. Porcelain extension stems extend from the header and laterals to the top surface of the concrete; heavy porcelain strainers are screwed into these stems. The laterals are formed by specially designed inflatable rubber tubes which are removed after the concrete has set. The top slab of the header is then poured, using asbestos-cement sheet forms which are left in place.

For full information about this remarkable new unit, write to The Permutit Company, Dept. PW-12, 330 West 42nd St., New York 18, N. Y., or to the Permutit Company of Canada, Ltd., Montreal.

Permutit

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SNO-PLOW

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One of the many features of the Frink V-Type Sno-Plow is its ability to remove snow faster. This is because the cutting edge and the front of the moldboard are built to keep the snow moving at all times, yet there is no side-thrust on the Frink.

EXCLUSIVE FRINK FEATURES

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2. Full selective power hydraulic control permits easier, faster handling.
3. Reversible cutting edges give double wear for greater economy.
4. Paneled moldboard—assures a lighter, more sturdy plow.

For the many other outstanding Frink features, write Box P49W, Clayton, New York, today.

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FRINK SNO-PLOWS, INC., CLAYTON, NEW YORK

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PUBLIC WORKS MAGAZINE

DECEMBER 1949 • VOLUME 80 • NO. 12

WHAT ARE HIGHWAY CAPACITIES?

HIGHWAY capacity has been the subject of careful and painstaking study for more than three decades. A recent report of the Committee on Highway Capacity of the Highway Research Board, prepared by O. K. Norman and W. P. Walker, and published in *Public Roads*, summarizes and analyzes the data now available. This is a report of remarkable value and is presented here in an abbreviated form for maximum usefulness to our readers.

The capacity of a roadway naturally depends upon a number of factors, including composition of traffic, roadway alinement, number and width of lanes, and vehicular speeds. In general, roadway capacity is influenced both by the physical features of the roadway and by the prevailing traffic conditions. These factors determine the three levels of roadway capacity, which are: (1) basic capacity; (2) possible capacity; and (3) practical capacity.

Basic capacity is the maximum number of passenger cars that can pass a given point on a lane or roadway during one hour under the most nearly ideal roadway and traffic conditions that can be attained. Possible capacity is the maximum number of vehicles that can pass a given point on a lane or roadway during one hour under the prevailing roadway and traffic conditions. It is the volume of traffic that cannot be exceeded in actuality without changing one or more of the conditions that prevail. Also, it is always necessary to state the conditions under which an expressed possible capacity is applicable. For instance, it is incorrect to state that the possible capacity of a 2-lane highway is 2,000 vehicles per hour. This statement must be amplified to include such factors as are important in determining the capacity. As an example, it might be stated that the possible capacity of a 2-lane, level, straight highway, having a 24-ft. wide surface, free from lateral obstructions within 6 ft. of the pavement edges, and with no major intersections at grade, is 2,000 passenger cars per hour.

The practical capacity is the maximum number of vehicles that can pass a given point on a traffic lane or roadway during one hour without a traffic density so great as to cause unreasonable delay, hazard or restriction. This practical capacity is the one of primary interest to the highway engineer.

Illustrations courtesy Bureau of Public Roads

Few drivers operate their vehicles in identically the same manner or react exactly the same under similar conditions. It is impossible, therefore to predict the effect of various roadway and traffic conditions on the individual driver. It has been found, however, that the combined effect on traffic as a whole can be predicted with reasonable accuracy.

The highest volumes of traffic per lane occur when vehicles travel between 30 and 40 miles per hour at the time the roadway is accommodating its maximum possible capacity. If a road has its maximum capacity at 30 mph, it will have only three-fourths that capacity at 15 mph; and only half as much at 9 mph. Any roadway condition that prevents traffic from moving safely at 30 mph, reduces the capacity of that roadway.

To understand why complete congestion can occur quickly when a highway is operating at or near its possible capacity, assume a 4-lane road, with two one-way lanes carrying 3,900 vehicles per hour at an average speed of 32 mph. Because of vehicles entering from a side road (or for any other reason) vehicle

speeds are reduced at this point to 20 mph. The capacity of the roadway at this speed is only 3,250 vehicles per hour, and vehicles immediately start to accumulate at the rate of 650 per hour, causing a sudden increase in the density of traffic. Even though the cause of delay lasted only a few seconds, a queue would form which would move down the highway in a direction opposite to that of the traffic flow and might extend for several miles. This queue might persist, even though traffic was operating normally between the queue and the place where it originally started to form.

Factors That Reduce Highway Capacity

In the accompanying table (Table 1) are shown the basic, possible and practical hourly capacities of various types of roadways under ideal traffic and roadway conditions when the flow of traffic is uninterrupted and sight distances are not restricted. These data are based on many years of study and observations. Many of the sources are given in the report.

It is seldom that roadway and traffic conditions are ideal. For this reason, the possible and practical capacities are usually lower than those shown in the table. If surface conditions be disregarded—and this is seldom a factor on a well-surfaced and properly maintained road—the most important considerations which affect the capacity of a highway where there is no interruption by cross traffic are: (1) Lane width; (2) clearances of lateral obstructions; (3) shoulder width and condition; (4) commercial vehicles; (5) location and design of interchange facilities; and (6) profile and alinement, especially as related to sight distance and gradient.

Effect of Lane Width and Lateral Clearance

Lanes which are narrower than the standard 12-ft. wide lane have a lesser capacity. On a 2-lane road, a vehicle passing another car must encroach for a longer period of time on the opposite lane if the lanes are narrow. On a multilane road, more vehicles straddle the lane lines when the lanes are narrow than when they are wide, thereby occupying, in effect, two lanes rather than one. Study has shown that lane widths affect capacity as indicated in the occompanying table.

Roadside obstructions, such as retaining walls, light poles, bridge structures and parked cars, adjacent to the edge of the traffic lane, reduce the effective width of the lane. A 24-ft. pavement with a bridge truss at each edge, for instance, has the same effective width as an 18-ft. pavement with 6-ft. shoulders. A 6-ft. clearance on both sides has no effect on the capacity of two 12-ft. lanes. If the sides have only 4-ft. clearances, the effective pavement width is reduced to 23 ft. from 24 ft.; similar 2-ft. clearances reduce the effective width to 21 ft., equalling two 10½-ft. lanes; and no clearance makes the 24-ft. pavement equivalent in capacity to an 18-ft. pavement. Such reductions apply only to lanes adjacent to the obstruction, when the obstruction is only on one side.

TABLE 1—Roadway Capacities, Uninterrupted Flow and Ideal Conditions, Passenger Cars Per Hour

	Basic Capacity	Practical Capacity—Urban	Practical Capacity—Rural
2-lane (total for both)	2,000	1,500	900
3-lane (total for all)	4,000	2,000	1,500
Multilane (per lane)	2,000	1,500	1,000

In applying these factors to computations of roadway capacities, judgment must be exercised where the lateral restrictions are not continuous. However, a single lateral restriction can cause a bottleneck which will affect the possible capacity of a road, though the practical capacity may be affected only slightly.

For instance, one bridge 24 ft. wide and 100 ft. long on a highway with a normal paved width of 24 ft. and a shoulder width of 8 ft., would reduce the possible capacity of the highway by 24%; and would reduce the practical capacity by 30%, but the latter reduction would occur for only a short distance. No exact data are available as to the distance over which traffic will be affected; however, it appears that the effects will be felt about 9 seconds before reaching the obstruction, and that the net effect will be approximately the same as the full effect for 4½ seconds, plus the length of the restrictive clearance. With traffic averaging 45 mph or about 66 ft. per second, the effect would be felt over 4½ x 66, plus 100, or about 397 ft.; and over this distance capacity would be affected 30%. For a one-mile section of highway which includes such a bridge, the practical capacity would be about 93% of what it would have been with no lateral restriction. This figure is arrived at

● *ROADSIDE guard rail with ample lateral clearance causes no decrease of highway capacity. Grade restricts sight distance.*

TABLE 2—Effect of Lane Width on Capacity

	Lane Width			
	12 ft.	11 ft.	10 ft.	9 ft.
2-lane rural, possible*	100	88	81	76
2-lane rural, practical	100	86	77	70
2 lanes, one direction	100	97	91	81

Capacity is expressed as percentage of 12-ft. lane capacity.

by considering that 397 ft. of the one mile of road are operated at 70% of capacity and that 4,883 feet of the mile are operated at 100%.

A disabled vehicle may be expected for every eight to ten thousand miles of vehicle travel. Even a minor accident, resulting in the stoppage of a car and causing a reduction in the speed of vehicles using a roadway, can greatly affect traffic capacity—unless shoulders are wide enough to permit disabled vehicles to clear the traffic lanes. A blocked lane, even on a 4-lane road, causes merging of traffic into the remaining lanes and a reduction in speed to 20 miles an hour (with 87% of the capacity at 30 mph) or even to 10 mph, (with about 50% capacity). Moreover, when lanes are less than 12 ft. wide, shoulders treated with bituminous materials to a width of 4 ft. on either side have the effect of increasing the width of adjacent traffic lanes by 1 ft.

Commercial Vehicles

Commercial vehicles reduce both the practical and the possible capacities of a highway in terms of vehicles per hour because of several factors. They occupy greater road space than passenger cars and influence traffic over a wider area; and they generally travel at lower speeds, especially on upgrades. On multilane roads, with uninterrupted flow, one commercial vehicle of the dual rear axle type has about the same effect as two passenger cars on level terrain, and of four passenger cars in rolling terrain. That is, conditions will be about the same with 115 trucks plus 1,040 passenger cars in rolling country as with 1,500 passenger cars. In mountainous country, there is greater variation, but one commercial vehicle will have approximately the same effect as eight passenger cars. On 2-lane roads, the effect of commercial vehicles is about 25% greater than on multilane expressways, but varies with several factors.

It should be noted that the percentage of commercial vehicles during peak traffic hours is generally lower than the average percentage for all hours.

In general, if 10% of the peak hour vehicles are dual axle trucks, a multilane road will have about 91% of its capacity in terms of passenger cars on level terrain and about 77% on rolling terrain. If 20% of the vehicles are trucks, the capacity percentages given above will be reduced to 83% and 63%. These values do not include the effect of bus stops.

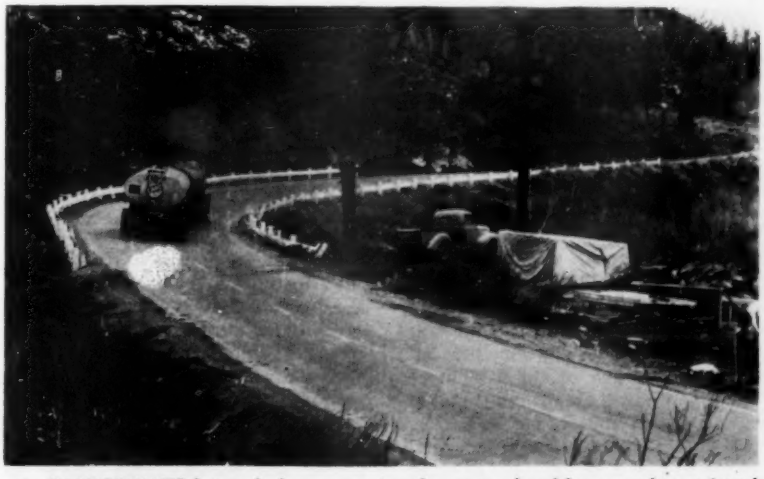
● ***TWO-LANE road without shoulders and lacking lateral clearance.***

Alinement and profile affect sight distances and thus highway capacity. Sight distances are of two kinds —stopping sight distance, which is the distance required to stop a vehicle after an object in the roadway becomes visible; and passing sight distance, or the distance that must be available to enable safe passing of another car. The reduction in the capacity of a highway due to short sight distances can be obtained by using as a criterion the percentage of length of the highway on which sight distances are insufficient to permit safe passing. This, of course, depends on the speed of travel. Studies have shown that a sight distance of 1,500 to 2,000 feet is required on a 2-lane road to pass a vehicle traveling between 45 and 50 mph with the possibility of oncoming cars traveling at 70 mph. Where such sight distances are not continuously available, the percentage of total length of the highway with a 1,500-ft. sight distance can be used to determine the practical capacity of the highway. Studies show that, on a 2-lane road, with operating speeds of 45 to 50 mph, the practical capacity is 900 cars per hour where there is no sight distance less than 1,500 ft.; 860 cars per hour where 20% of the highway length is so restricted; 800 cars with 40% of the length so restricted; 720 cars with 60%; 620 cars with 80%; and 500 cars when the entire length of road has such restricted sight distance.

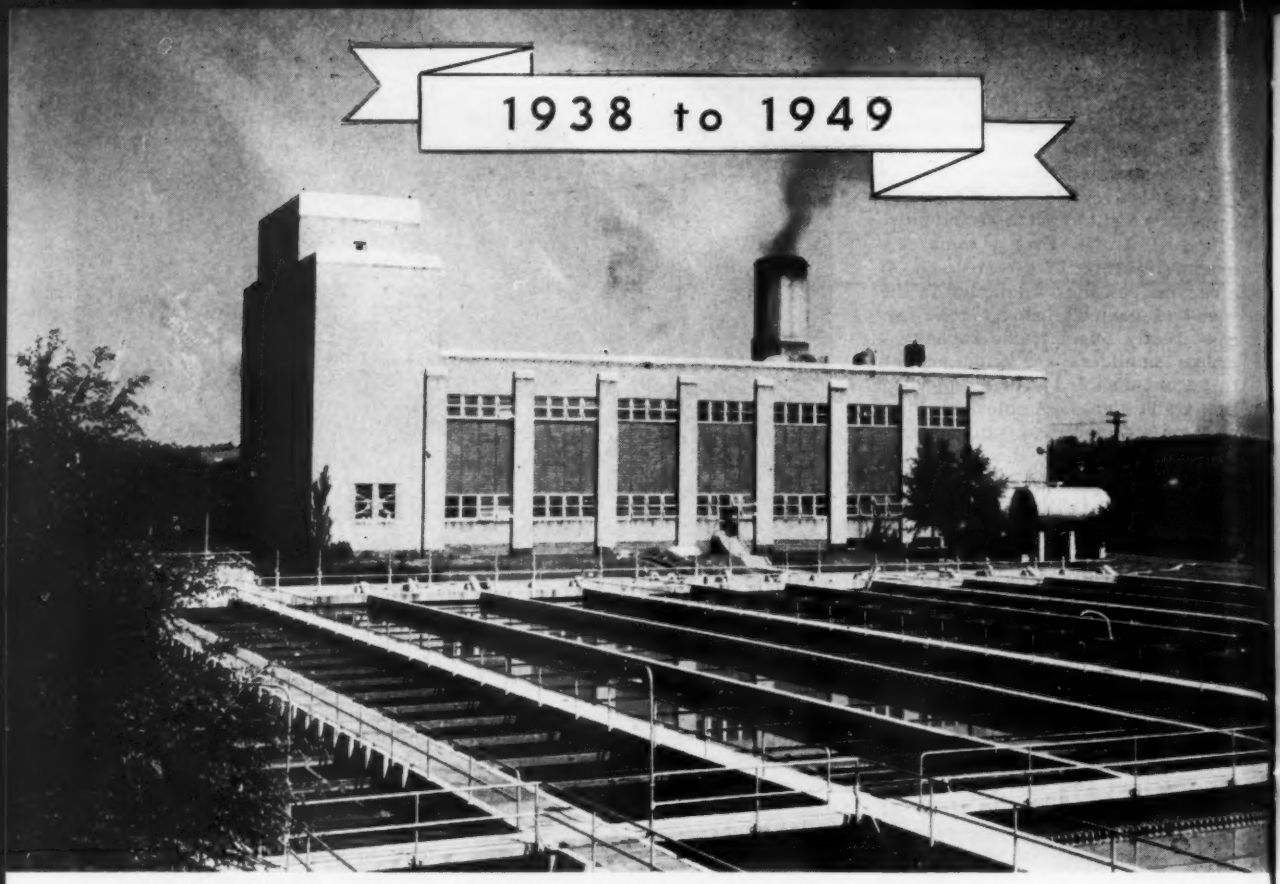
Grades and Hills

Grades affect highway capacity in at least three ways: (1) Vehicle braking distances are greater down grades, requiring longer spacings of vehicles; and the reverse is true on upgrades; (2) A grade usually restricts sight distance and affects ca-

(Continued on page 42)



● ***INADEQUATE lateral clearance; inadequate shoulders; and restricted sight distance greatly reduce highway traffic capacity.***



● ***SLUDGE FILTRATION** and incineration building in the background, with some of the settling tanks in the foreground.*

FILTRATION OF SLUDGE

at Minneapolis-St. Paul

VACUUM filtration of sludge has been practiced at the sewage treatment plant of the Minneapolis-St. Paul Sanitary District for ten years. The report for the calendar year 1948 contains unusual information on the use of ferric sulphate for sludge conditioning, on methods of filter washing, and on costs of filtration and sludge disposal.

The sludge removed from the settling tanks is pumped to sludge concentration tanks, where it is held for approximately one day. The average increase in solids content was from 7.31% to 8.25% as a result of this holding; in addition it is felt that such storage produces a more uniform sludge. From the concentration tanks, the sludge is fed by pipe line to bucket conveyors and thence to two 2,000-gal. air agitated conditioning tanks. From these, the sludge discharges by gravity to 6 vacuum filters. Each filter is 11 ft. 6 in. in diameter and 14 ft. long, with an effective filtering area of 500 sq. ft. The filtrate is returned to the settling tanks; the filter cake is discharged by belt conveyors to incinerators.

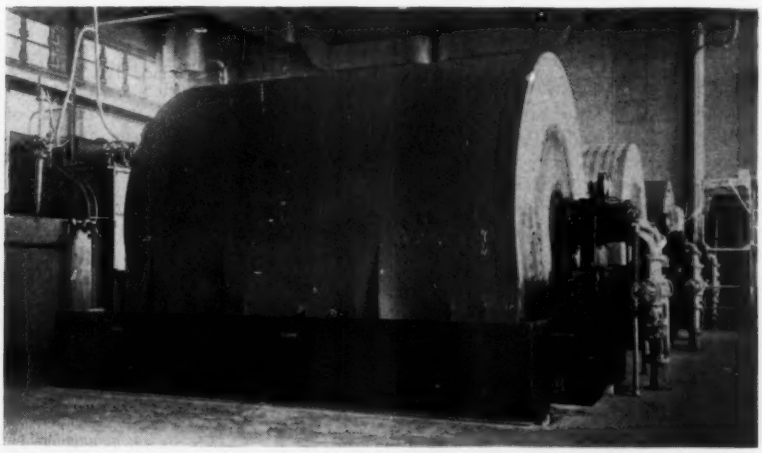
The average flow of sewage for the year was 122.8 mgd. After removal of screenings and grit, the average raw sewage suspended solids was 265 ppm, of which 71.7% was removed in the settling tanks.

The raw sludge as pumped from the settling tanks, had an average solids content of 7.31%, ranging from 5.23% to 12.3%, the latter figure representing rain and thaw solids combined with St. Paul water softening plant lime sludge. After concentration, the sludge averaged 8.25% solids, but varied from 5.86% to 15.9%. Average raw sludge pH was 6.1, with variations from 5.7 to 6.7; the pH of the thickened sludge averaged 5.9, ranging from 5.6 to 6.4. Previous experiences had indicated that pH values of 5.5 or lower make the sludge more difficult to filter. The character of the sludge varies considerably from day to day, due primarily to storms and industrial waste contributions.

Raw sludge samples are daily 24-hour composites of grab samples from sampling cocks on the sludge pumps. On every pump, a sample is taken 15 minutes after starting, every 15 minutes during operation, and when the pump is to be stopped Concentrated sludge samples are daily 24-hour composites of the sludge going to the conditioning tanks, and are obtained by taking two 100 ml. ladles per hour from a bucket of each bucket elevator operating. This provides a composite sample of one to two gallons. Filter

cake samples are daily 24-hour composites collected by applying a cookie cutter to the discharge side of the vacuum filters. One cookie is collected each hour from each filter. Sludge filtrate samples are 24-hour composites of grab samples collected from the filtrate receivers.

In 1948, the total flow of sewage was 43,549 million gallons, and 34,549 tons of dry sludge solids were removed, an average of slightly under 0.8 ton per million gallons. The estimated tributary population is 940,000; if allowance is made for industrial wastes, the population equivalent is 1,203,000. On this basis, including industrial wastes, the dry sludge solids amount to about 57 lbs. per capita per year or 160 pounds per day per 10,000 population.



● ***SLUDGE blanket is being removed from one of the filters during normal operation. Other filters are in the background.***

Ferric Sulfate Used in Sludge Conditioning

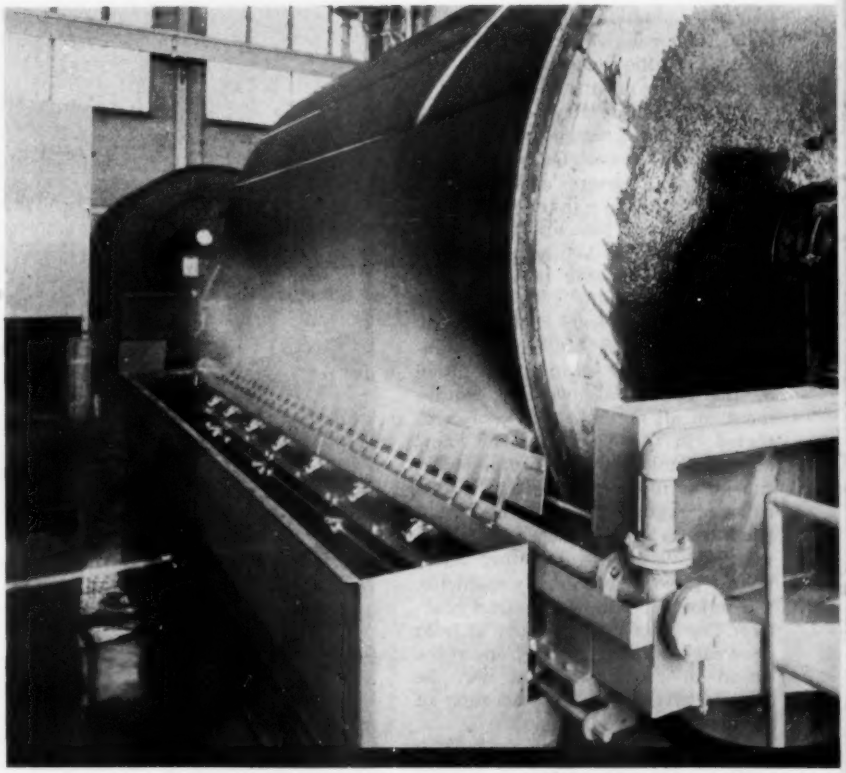
Prior to the middle of 1947, ferric chloride and lime were used for conditioning the sludge for filtration. Inability to obtain ferric chloride after that time required that ferric sulfate be used instead. For the first five months of 1947, when ferric chloride was used, the average dosage was 0.91% of ferric chloride and 2.53% of lime, based on the dry solids. For the last seven months of that year, the average dosage was 1.52% of ferric sulfate (expressed in terms of ferric chloride) and 4.45% of lime.

Economical sludge conditioning is a process very sensitive to such factors as concentration of the solution, point of addition of the chemical to the sludge, and the method of mixing. Considerable research and many trials were therefore necessary when ferric sulfate was adopted. As a result of these studies, the dosage of ferric sulfate, expressed as ferric chloride dropped, during 1948, to 1.23% and lime dosage also dropped to 3.17%. This compares very favorably with previous results using ferric chloride, since the 1948 sludge was higher in chemical-consuming volatile solids —69.8% as compared to 65.2% for the 1942-1946 period. The 1939-1948 average iron dosage was 1.36%; and the 1944-1948 average was 1.14%.

Reducing Chemical Dosages

Factors in the reduction of chemical dosages are: (1) maintaining total alkalinity of the thickened raw sludge in a maximum range between 1,000 and 1,500 ppm. calcium carbonate; and (2) Close control of the pH of the conditioned sludge between 9.0 and 10.0. During 1948, the total alkalinity of the thickened sludge averaged 1,000 ppm. $CaCO_3$, with the pH averaging 9.6. Previous studies have shown that a slimy bacterial mold, very gelatinous in appearance, forms on the filter screens, division strips and pipe lines if attempts are made to filter at pH 8.5 or less, so as to eliminate calcium carbonate deposition. Filtering above pH 10.0, results in considerable calcium carbonate deposits and blinding of the filter cloths. With the control measures in force in 1948, average filter cloth life was 533 hours.

In an endeavor to reduce still further the costs of chemical conditioning, an alkaline catalyzer was tested. It was found that the use of this chemical permitted a 31% reduction in the ferric sulfate dos-



● ***NEW spray header on the discharge side of the vacuum filters for continu washing. Take-off plate removed to show action.***

age, but increased filter washing and reduced output were considered to nullify this advantage and it was concluded that no overall savings would result.

Filter Cloth Life and Filter Washing Methods

The average life of filter cloths, 533 hours, was the highest on record, and compared with 413 hours in 1947, and a previous high of 474 hours in 1944. It is believed that this increased life may be partly due to the practice of spray-washing the filters at least once an hour (inaugurated in Nov. 1947) and to closer regulation of chemical coagulation by frequent pH tests (inaugurated June, 1948), keeping the pH between 9 and 10 without regard to the iron-lime ratio formerly used as a guide. Other factors which may have contributed to longer cloth life include improvements in sludge conditioning (more agitation and changes in point of chemical addition) and the installation of a preheater on the lime-slaker water supply.

When the plant first started operation, the filters were washed at intervals of 24 hours or longer. This was changed to a wash each 8 hours; and in 1942 to every 4 hours. The more frequent washings resulted in marked reductions in the quantity of sludge-conditioning chemicals used. A method was therefore developed for continuous washing without the necessity of removing the filters from service.

The new method of washing a filter while it keeps right on producing sludge cake involved moving the wash water pipe and spray nozzles to a location behind and below the top edge of the take-off plate so that the washing is done on the section of the drum between the cake takeoff and the line of submergence of the drum. Installation of the continuous washing equipment on all of the filters was completed in early 1945. The new arrangement permits continuous discharge of filter cake without interruption, reduces filtration costs and produces a more even feed. Well water is used for washing. After trying various washing frequencies, the following is now standard practice: The filters are washed at least once each hour for at least one revolution of the drum, and may be washed oftener at the discretion of the operator.

In addition to recording filtration rates on the usual basis of pounds of dry cake solids per sq. ft. per hour, counters have been placed on the filters to record drum revolutions, permitting determination of the actual filtering surface used in any period of time. Records are computed on both bases, the latter giving the amount of solids actually filtered per sq. ft. of filter area used. In 1948, the average production on a dry basis was 3.14 lbs. per sq. ft. per hour, and 0.27 lb. per sq. ft. of filter area actually used. The figures for the preceding year were 3.28 and 0.29. Average cake solids content was 31.1%, and 66.3% of the solids were combustible.

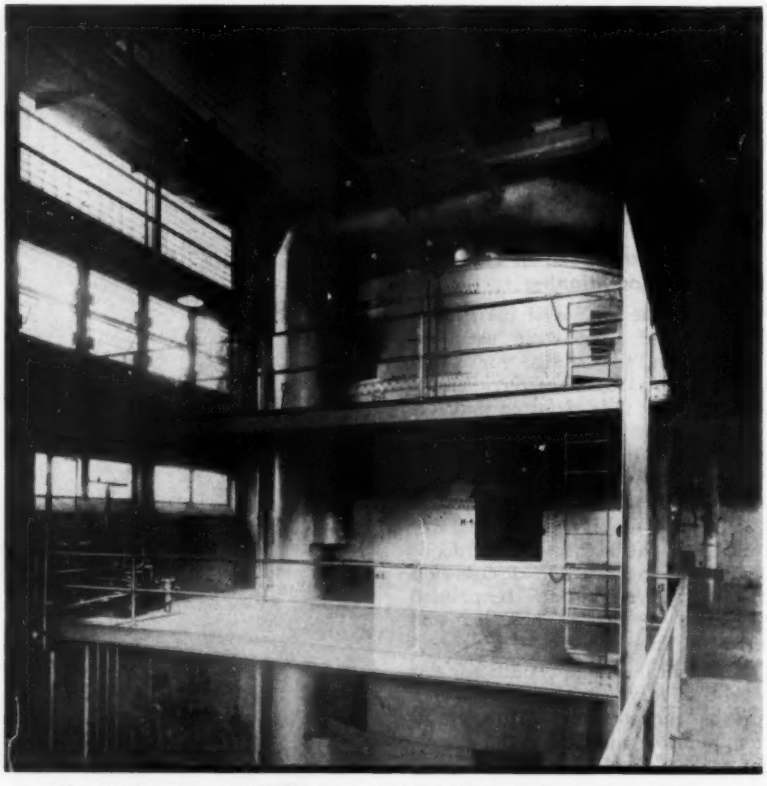
Filtration Rates and Costs

The costs per ton of dry sludge solids are, for chemicals, $1.27 and for other filtration costs $2.33, making a total cost of vacuum filtration of $3.60 per ton. Lime prices increased 14.4% during 1948 and ferric sulfate prices 11.0%. In spite of these increases the chemical cost of filtering increased only 5% from $1.21 for 1947 to $1.27 for 1948. However, costs are higher than 5 years ago.

The cost of incineration and disposal of the sludge cake was $1.79 per ton of dry solids in 1948, an increase of 37 cents over the preceding year. A total of 112,700 tons of filter cake were incinerated, containing 35,048 tons of dry solids. For this, there were required 11.7 KW of electricity and 0.51 gal. fuel oil per dry ton, and 11,740 tons of dry ash were produced.

Only a very small portion of the filter cake is used for fertilizer—none of the fresh cake. Since no digestion is provided, and raw sludge only is filtered, the State Department of Health requires that the sludge be stockpiled for 2 years or more before use as a fertilizer in order to destroy the eggs of intestinal parasites.

The Minneapolis-St. Paul Sanitary District plant provides sewage treatment facilities for the cities of Minneapolis and St. Paul, plus some contiguous communities. It is administered by a Board of Trustees representing the two cities. The engineering staff is headed by Kerwin L. Mick, Chief Engineer and Superintendent. John C. Sager is Engineer of Maintenance and Design; Maurice L. Robins is Chief Chemist and Sanitary Engineer; and Benjamin M. Storey is Assistant Engineer. Plant Operators are W. M. Trulander, W. J. Wade, Glenn Stroessenreuther and G. E. Waters, with K. M. Pett, S. P. Cushman and S. E. Linsley, Assistant Plant Operators.



● ***INCINERATION of 35,048 tons of dry solids in the form of filter cake required 11.7 kwh and 0.51 gal. of fuel per ton.***

Radford Reports

LARGE SAVING *on* SNOW REMOVAL COSTS

W. A. WOODWARD
City Manager, Radford, Va.

WITH the help of modern materials and methods we have been able to reduce our snow and ice removal costs substantially in Radford. C. J. Smith, Superintendent of Streets, and the men in his department have developed a program that gives better snow and ice removal service to the community than ever before and does it with surprising economy.

Our major saving springs from the fact that we now spread rock salt instead of abrasives on 35 miles of main streets. As a result of that single change, we have cut our application cost by 80 per cent. Today three men on one truck, using a mechanical rock salt spreader, can cover the same distance that it used to take five trucks and 15 men to cover when we spread abrasives.

In addition to this, we have found that we don't have to go over the routes time and again during a continuing storm. Using plain abrasives, we had to make many trips, because the grit was quickly covered by additional snow or blown away by the wind.

Added to this disadvantage was the fact that abrasives built up a thick mat of snow and ice that froze to the streets. During the day when the sun was out and surface melting occurred, ruts and holes formed in this mat and made driving on it both difficult and dangerous. The abrasives tracked into stores and homes and when the snow finally halted, our streets were littered with dirt. Drains and sewers were clogged, and every spring we had to spend additional money cleaning out catch basins.

Because salt removes snow and ice, instead of merely covering them up, we no longer have that trouble or expense. Spread early in a storm, rock salt completely removes light snowfalls and makes it unnecessary to plow. When the fall is heavy it keeps the snow from packing and freezing to the street surface. When snow has already frozen or ice has formed, the rock salt crystals break up the ice and loosen the bond to the street surface.

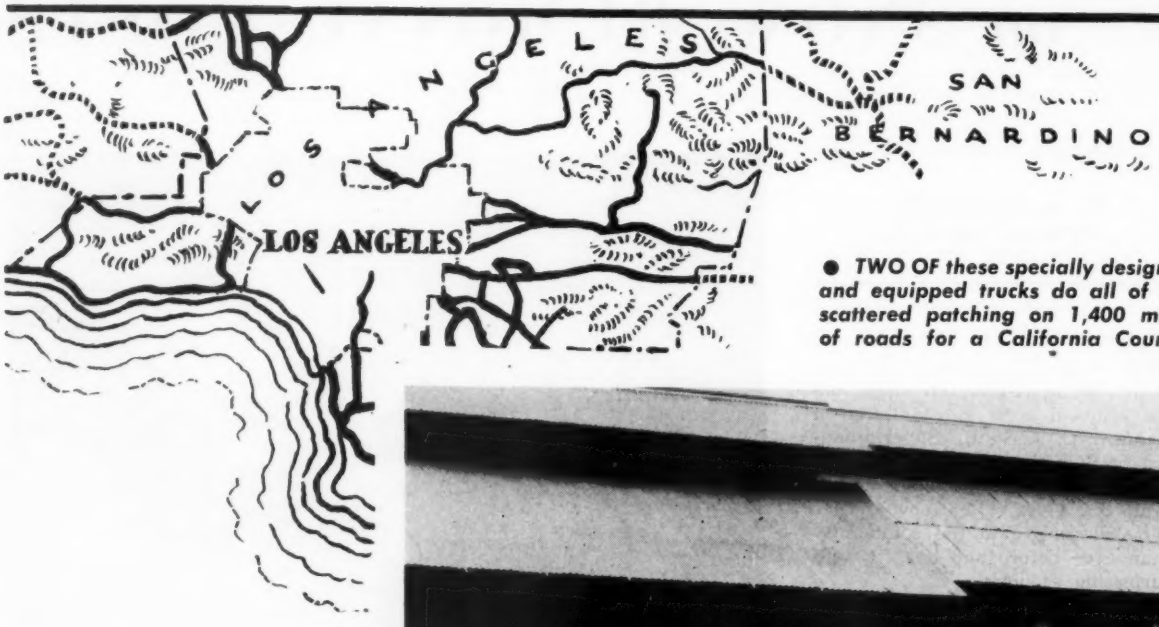
● ***ONE OF Radford's snow removal units. Salt is used to remove light snowfalls and to keep heavy snow from packing and freezing.***

As soon as the streets get white with snow, or ice begins to form on them, we go out with our first rock salt application, spreading approximately one-eighth of a pound of rock salt per square yard of street. On a 20-foot street the truck travels down the center, going about 10 or 15 miles per hour. With a mechanical spreader we have found that this procedure gives us curb to curb coverage with one trip. If the storm produces as much as two inches of snow, we put down a second application, following the same routine. In the case of ice formed from sleet, additional applications are used as needed to provide ice-free streets for the safety of drivers and pedestrians alike.

To make sure that we get out at the start of a storm, Mr. Smith keeps a close watch on the weather, and he has organized his force so that the men are on the job when snow or sleet starts to fall. We store a supply of rock salt well in advance of winter; as a result, when storms do come we are able to handle them promptly and efficiently.

Our ice and snow removal program has received considerable support from the public, not only because of the economy of our operation, but also because we give drivers and pedestrians summer-safe streets all winter long.

HOT OIL ROAD PATCHERS



● *TWO OF these specially designed and equipped trucks do all of the scattered patching on 1,400 miles of roads for a California County.*

EARLE A. BURT

Chief Deputy Road Commissioner,

Los Angeles County, Calif.

FOUR hot oil road patchers were recently put into service by the Los Angeles County Road Department. These are completely equipped independent units, with special cabs seating six-man crews, and with specially designed flat-bed bodies mounted on six-wheel Mack trucks. The County now has six of these units and for the type of work they are used for, they are entirely satisfactory.

These hot oil patching trucks have been developed to accomplish a rather specialized type of highway maintenance. The type of work on which they are highly effective involves cases where there are only a few spots to be patched over a rather extensive mileage. Experience has shown that these trucks are also extremely effective on so-called permit patching, necessitated by the large number of excavations made in our roads for the purpose of installing such utilities as water and gas. Where patching is required over an extensive area, and does not involve considerable travel from job to job, one or two flat bed trucks and separate oil-spraying equipment is more effective.

Descriptions of the Units

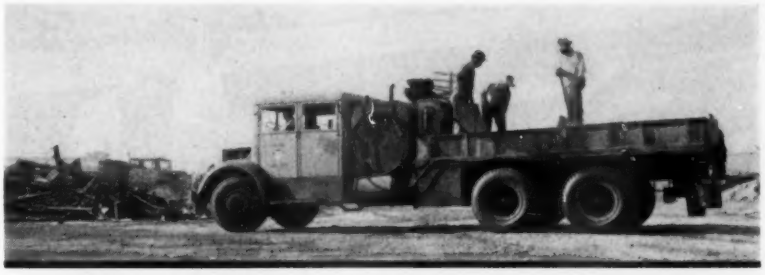
Each unit consists of a 10-ton chassis, equipped with a 6-man cab. Immediately behind the cab is mounted a 350-gal. insulated oil tank; and in the rear of the tank is the flat bed with removable sides which is used for transporting rock and asphaltic mixtures to a maximum of 8 tons. The oil tank is insulated with 4 ins. of a special glass-type insulation which has been found resistant to heat and vibration and does not break down under such usage. The tank has a gear-driven oil pump which operates from a power take-off from the main transmission of the truck. One of the very special features of this unit is the provision of exhaust gas heating of the oil tank.

The heat provided by the exhaust is sufficient not only to maintain the oil at the original 400° at which it is placed in the tank, but also to increase the temperature during the day. A by-pass is provided for the

EXPEDITE MAINTENANCE

exhaust gases in case the oil becomes too warm.

As an indication of the work that can be accomplished by equipment of this kind, we have two units in one district and they do all of the scattered patching on 1,400 miles of road. It should be pointed out, however, that this is possible only because we have a very intensive resurfacing program each year. As a consequence of this major resurfacing program, the number of holes that must be patched are maintained at a minimum.



● *ON-THE-JOB view of one of the trucks shown below at left.*

Other Jobs These Units Can Do

Ordinarily, the bituminous material used for patching is SC-6 asphaltic road oil. It is entirely possible, however, to handle various types of emulsion; and under certain conditions we have found this equipment wholly satisfactory for doing odd jobs of concrete patching. When utilized for the purpose, the tank is filled with water, and the after part of the unit carries the cement, aggregates and a small concrete mixer.

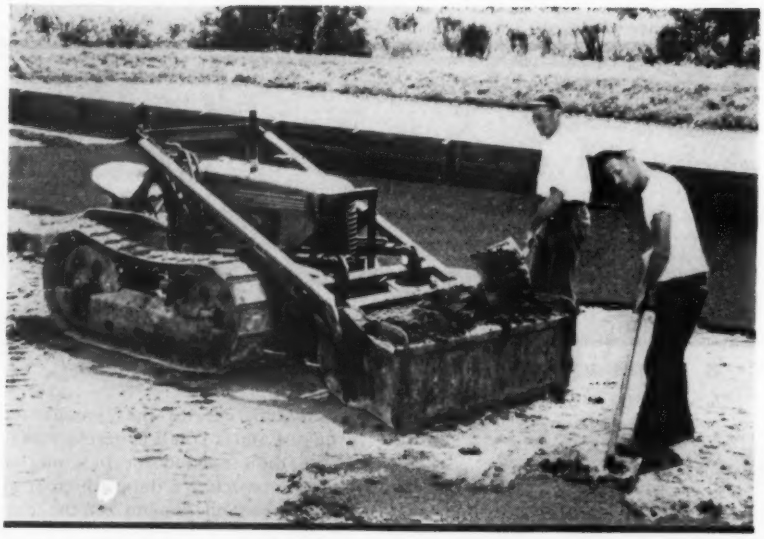
The tools needed for patching or for other work are determined from experience and depend on the particular type of work that must be done. The capacity of the unit is ample to carry whatever is needed. Special tool boxes are provided on these units.

In developing a unit of this type, it is desirable to determine the type of chassis that will be used before any attempt is made to plan the layout of equipment to be installed. Slight variations exist among the various available 10-ton chasses and these may result in slight deviations in installing the equipment.

It is emphasized that these units we have developed are specifically for scattered patching work where a rather extensive mileage of roads is involved and where a progressive program of resurfacing is carried on as an integral part of the road maintenance program. For different conditions, a somewhat different design of maintenance unit may be more efficient.

● *LOADED truck. Note aggregate, oil tank and equipment.*

Removing Sludge from Beds with HYDRAULIC LOADER



● ***LOTS EASIER than shoveling sludge into a truck or taking it off the bed in wheelbarrows. Tractor treads do not damage beds.***

SLUDGE is removed from the open beds of the Medina, O., sewage treatment plant with a Ware front end loader mounted on an Oliver 42 Cletrac tractor. The treatment plant, which consists of primary settling tanks, trickling filters, secondary settling and separate sludge digestion, originally had 1,672 sq. ft. of covered sludge drying beds and 11,760 sq. ft. of open beds. Later, other beds were added so that, at present, open bed area is about 36,000 sq. ft.

Sludge removal from the open beds was previously accomplished with wheelbarrows. Two men are required to operate the plant, and it was necessary to hire two additional men in the summer to remove sludge from the beds. This made removal costly, and because the work was hard and tiresome, it was not always possible to get good men; or even any at all.

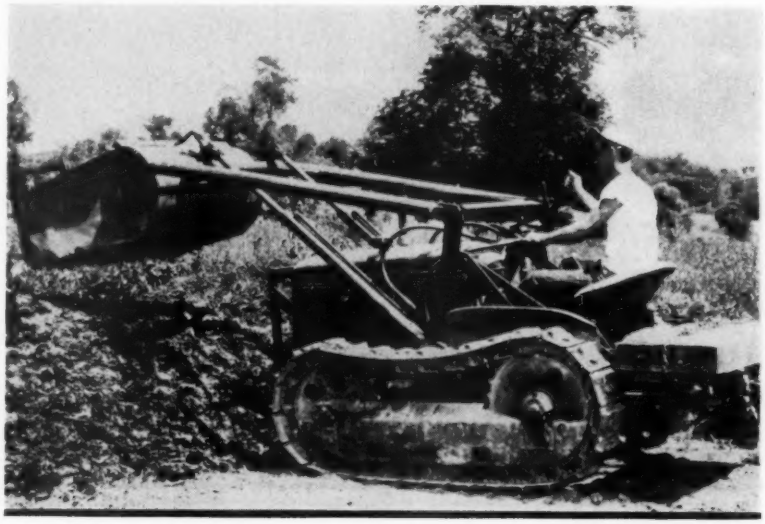
At the end of 1947, an Oliver HG 42 Cletrac crawler tractor was purchased and equipped with the Ware hydraulic front end loader. The bucket was modified by a local machine shop so that it was provided with a hinged door to facilitate dumping. The bucket capacity is 16 to 20 cu. ft. of dry sludge. The crawler treads on the tractor are 10 ins. wide.

The following information on operation has been furnished by W. Eugene Schlechty, superintendent of the plant: "We drive the tractor onto the bed and shovel the sludge into the bucket, which has been lowered so that it rests on the ground. When the bucket is full, it is raised and the tractor carries it to the dump, where it is piled for free use by the public. The bucket can be dumped at any height, the hinged door permitting it to be completely emptied.

"The tractor cost us $2,240 in 1947. We can operate it for 8 hours at a cost for fuel and oil, not including depreciation and repairs, of $1.25. We have now only one extra man in the summer and we can remove sludge in about one-third the time formerly required for removal with wheelbarrows. In 1948, we removed about 10,000 cubic feet of dry sludge from the beds. This is equivalent to 625 Clectrac loads or 3,333 wheelbarrow loads.

"At first, we thought the tractor would tear up the sand beds, but now we believe that the beds benefit from driving the tractor over them. The sand is kept loose and the underdrains are deep enough so they have never been damaged. After the sludge is removed from the beds, they are partly leveled by dragging the bucket over them with the tractor in reverse. Final treatment consists of hand floating to give smoothness, and leveling.

"We have found many other uses for this tractor around the plant. The sludge bucket can be removed and a smaller bucket installed for dirt or material handling; or a bulldozer can be mounted on the tractor. It can also be used for snow removal."



● ***TRACTOR-LOADER dumps the sludge on the waste pile. Bucket holds 16 to 20 cu. ft., or about six times as much as a barrow.***

Consulting Engineers Report

On Design and Construction

WATER WORKS IMPROVEMENTS

Plans for a gravel-packed well, pumping station and standpipe for Bristol, N. H., were prepared by **Howard E. Bailey,** Boston, Mass., and bids for the work were let last summer. **Hitchcock & Estabrook,** Minneapolis, were consultants for Odessa, Minn., on water works construction. Plans for a water supply system for Richfield, Minn., have been prepared by **McGregor & Davis,** Minneapolis. **Roberts & Merriman,** Pampa, Tex., were engineers on the new water works for Pampa.

Bids were recently received on a swimming and wading pool for Boone St. Playground, Cincinnati; **Wayne Becker** of that city was consultant. **Finkbeiner, Pettis & Strout** of Toledo engineered the new water works for Van Wert, O. A new dam for the Williamsport, Pa., Water Authority is being designed by **Gannett, Fleming, Corddry & Carpenter** of Harrisburg. **Harold Hoskins & Associates,** Lincoln, Nebr., were engineers for the recent water improvements at Hay Springs, Nebr. **Donald Mills** of Selma, Ala., was consultant on the new water works system for Hayneville. Plans for the projected water supply system for Moberly and Huntsville, Mo., are being prepared by **W. B. Rollins & Co.,** Kansas City, Mo.

Plans for purchase of and improvements to the water, sewer and gas systems of Falfurrias, Tex., including a complete new sewage treatment plant and a water pumping station, have been prepared by **The Marvin Turner Engineers,** Austin, Texas. Plans were prepared and bids received last summer for water main extensions and alteration for Opelousas, La., **M. J. Goudeau, Jr.,** engineer, Opelousas. **Hill & Hill,** North East, Pa., prepared the plans for additions to the borough water plant. **Myers & Noyes & Associates,** Dallas, Tex., are the engineers for the water purification and pumping plant for that city. **H. C. Nutting Co.,** Cincinnati, have been engaged by Bethlehem, Pa., to make a survey of water use and leakage and to consider the installation of meters. **Charles H. Sells, Inc.,** Pleasantville, N. Y., acted as consultant to Thornwood Water District, Thornwood, N. Y., for water main extensions.

Plans for water works, including treatment, for Newton and Kosciusko, Miss., have been prepared by **William E. Johnson** of Jackson. Wells, pumps, reservoirs and mains are included in the water works improvements planned for Middletown, O., by **Floyd G. Browne & Associates** of Marion. Water works improvements being handled by **Burns & McDonnel Engrg. Co.** of Kansas City, Mo., include extension of mains and softening plant for Ames, Ia., a new plant for Council Bluffs, and additions to the Menominee, Mich., and Springfield, Ill., plants. **Pfeifer & Schultz,** Minneapolis, are engineers for the water works improvements of Hibbing, Minn. The Village of Pine River, Minn., has engaged **Hitchcock & Estabrook,** Minneapolis, as consultants. Softening equipment and water main extensions for Pemberville, O., have been designed by **A. H. Smith Co.,** Toledo, O. **A. E. Stilson & Associates,** Columbus, O., are consultants on diversion dams, reservoirs and treatment plants for Hopedale and Woodsfield, O. Marble Falls, Tex., has retained **The Marvin Turner Engineers,** Austin, to design a water treatment plant; this firm has also been engaged by Burnet, Texas, to design water and sewerage facilities. **Alvord, Burdick & Howson,** Chicago, will ask for bids about the first of the year on a 48.5 mgd filter plant for Gary, Ind. **Emerson D. Wertz,** Bryan, O., is engineer for a water works improvement for Morenci, Mich.

Wisenbaker, Fix & Associates, Tyler, Tex., are consultants on water and sewer improvements for Gilmer, water extensions for Linden, and street improvements for Overton, all in Texas. **Ralph L. Woolpert Co.,** Dayton, O., are planning a water supply system for Montgomery Co., O. **Banister Engineering Co.,** St. Paul, Minn., is consultant for water and sewer improvements for Atwater, Minn.

Black & Veatch, Kansas City, Mo., are consultants on a 4 mgd purification plant for Worland, Wyo., and will call for bids early in 1950. The Borough of Howard, Pa., **Geo. S. Denithorne,** State College, Pa., consultant, plans a reservoir and pipe line. **Henningson Engrg. Co.,** Omaha, Nebr., called for bids this fall on a 1 mgd water plant for Spirit Lake, Ia. **Hitchcock & Estabrook,** Minneapolis, are working on the plans for water and sewerage facilities for Milbank, S. D. A municipal swimming pool for the city of Lyons, Kans., has been designed by **Wilson & Co.,** Salina. **Ralph Woolpert,** Dayton, O., has made his final report on the Greenville, O., water development.

Proposed water improvements for Thebes, Ill., are being designed by **James G. Cooney,** Belleville, Ill. **Francis Engrg. Co.,** Saginaw, Mich., report the following water works activities: Study of system rehabilitation for Sparta; started construction on complete system for Auburn, Linden and Perrinton; construction under way for improvements at Millington and Bay City; and plans near completion for Frankfort, Olivet and Ontonagon. All of these are in Michigan. **Greeley & Hansen,** Chicago, are engineers for water works improvements for Niagara Falls, N. Y. Water works extensions for Red Bay, Ala., are being planned by **J. E. O'Toole Engrg. Co.,** Birmingham, Ala. **S. A. Russell,** Rosenberg, Tex., has completed plans for a water system for Brookshire, Tex., and for water and sewer extensions for Alvin.

Water works improvements estimated to cost $1,800,000 are being planned for Steubenville, O., by **Floyd G. Browne & Associates,** Marion. **Pfeifer & Shultz,** Minneapolis, are reporting on a water system for Lake Lillian, Minn., and Minot, N. D. **Damon Runyan,** Longmont, Colo., will receive bids in the early spring for water improvements for Baker, Colo., Metropolitan District. **R. L. Streeter,** Casper, Wyo., will probably be ready to receive bids next summer on a water treatment plant and other improvements for Thermopolis.

Road and Bridge Work

Rowat & Murray, Belmond, Ia., acted as consulting engineers on curb and gutter, pavement and sidewalk construction for Clarion, Ia., during the past summer. **E. G. Briggs,** 2360 University Ave., St. Paul, Minn., received bids in the early summer on plant mix bituminous street surfacing for Bovey, Minn., estimated

to cost $100,000. For repairs and new floor for the Wells St. bridge, Fort Wayne, Ind., the engineers were **Darling & Darling** of Fort Wayne; also for a 4-span continuous beam steel bridge for Allen Co.

Frank J. Oleri of West New York, N. J., was consulting engineer on paving and street improvements for several New Jersey communities, including West New York, Guttenberg, and Fairview. The work was completed during the summer. The Village of Wayne, Mich., retained **Peter E. Brender** of Wayne as consultant on 30,000 sq. yds. of paving and 2,000 ft. of 48-inch drains. **William E. Johnson** of Jackson, Miss., has supervised street improvements to cost about $100,000 for Forest, Miss., and received bids about Aug. 1 for similar work for Union, Miss.

Lettings are scheduled by **Rowat & Murray,** Belmond, Ia., for this winter, as follows: Concrete paving, Belmond and Clarion; concrete or bituminous pavement, Garner; and pavement widening and combined curb and gutter, Dows, Ia. **Chas. P. Smith & Associates** of Port Arthur, Tex., and **George Schaumburg** of Beaumont, Tex., are consultants on a city-wide paving and storm sewer project for Port Arthur, covering about 100 miles of new street paving, 15 miles of resurfacing and incidental storm sewer extensions.

Eight nationally known engineering firms have been retained by the New Jersey Turnpike Authority to prepare plans and specifications for the new 118-mile turnpike. These are **Amman & Whitney,** New York; **Edwards & Kelcey, Frederick R. Harris, Inc., O. J. Porter & Co.,** Associated, Newark; **Fay, Spofford & Thorndike** of Boston and New York; **Howard, Needles, Tammen & Bergendorff** of New York; **DeLeuw, Cather & Co.,** Chicago; **Parsons, Brinckerhoff, Hall & Macdonald,** New York **J. E. Greiner Co.,** Baltimore; and **Gannet, Fleming, Corddry & Carpenter, Inc.,** Harrisburg.

SEWERAGE AND REFUSE

The consulting engineer on sewage treatment plants at Sheridan, Harrisburg, Prineville and Tillamook, Ore., and Clarkston, Wash., was **R. H. Corey** of Portland, Ore. Work recently handled by **Clarke Gardner** of Salisbury, Md., included a 125-ton incinerator and a 3-mgd sewage treatment plant for Salisbury; trunk sewer extensions at Seaford, Del., and sewer extensions and a pumping station for the Maryland Tuberculosis Sanitarium. **Sidney Hall, Inc.,** of Eau Claire, Wisc., has been consultant on additions to the sewage plants for Eau Claire, and Thorp, Wisc.; and new treatment plants at Durand, Cornell and Owen. **O'Brien & Gere** of Syracuse report that Section 2 of the Bear Trap trunk sewer, on which they are engineers, involved some difficult quicksand construction.

A school sewage treatment plant to cost about $75,000 has been designed for Jefferson County, Ky., by **Howard K. Bell** of Lexington. Addition to the Richmond, Ind., sewage treatment plant, **Henry B. Steeg & Associates,** consultants, will include blowers, aerators, sludge collection equipment and sludge heaters.

A sewage treatment plant and 11 miles of sewers are being planned for Bay City, Mich., by **Francis Engrg. Co.** and **Russell A. Dodge** of Saginaw. **I. M. Glace,** Harrisburg, is consultant on a new filter plant for Steelton, Pa.; a sewerage system and treatment plant for New Cumberland, Pa., and a treatment plant for Washington, N. J. **Chas. A. Haskins,** Kansas City, Mo., is consultant on several jobs, including the 26th Ave. combined sewer for North Kansas City. A complete sewer system and treatment plant has been designed for Onamia, Minn., by **Hitchcock & Estabrook** of Minneapolis. Bids will be called this month on a treatment plant and pumping stations for the West Long Beach Sewer District, Atlantic Beach, N. Y. The consultant is **C. MacCallum** of Port Washington, who has previously engineered a sewer system for the district, and also for Port Washington sewer district.

Morrison Engrg. Co., Helena, Mont., is engineer for the following jobs in Montana: Cut Bank, sewage lift station and treatment plant; Belgrade, pumping station; Fort Benton and Deer Lodge, storm sewers. **Virginia Engrg. Co.,** Virginia, Minn., has designed a sewer system and disposal plant for Aurora and a treatment plant for Biwabik. **Emerson D. Wertz & Associates,** Bryan, O., have designed a sewer system and treatment plant for Sherwood, O.

Sewage treatment plans for Albert Lea, Minn., involving 2-stage filters, have been prepared by **Banister Engrg. Co.,** St. Paul; also sewers and sewage treatment for Watkins, Minn. **Olney Borden,** Liberty, N. Y., is designing a sewer system and treatment plant for Sackett Lake, N. Y., sewer district, to cost $170,000. **Haley & Ward,** Boston, are engineers for sewage treatment plant improvements at Milford, Mass., and storm drainage at Southboro. Treatment plant improvements and enlargements for Berea, O., are being planed by **Rollin F. MacDowell** of Cleveland. Princeton, Ill., has re-

(Continued on page 40)

LEADERS IN THE PUBLIC WORKS FIELD

C. M. UPHAM

★

Long one of the world's leading highway engineers, Charles M. Upham is best known for his work with the American Road Builders' Association, of which he has been engineer-director for many years. Before that he was chief engineer of the North Carolina Highway Department and attracted the attention of all highway engineers by his construction program. He was graduated from Tufts College in 1908, and has been a national asset in the highway field ever since.

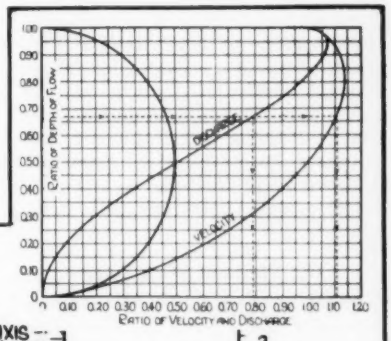
How to Find VELOCITY and DISCHARGE of Partially Full Circular Sewers

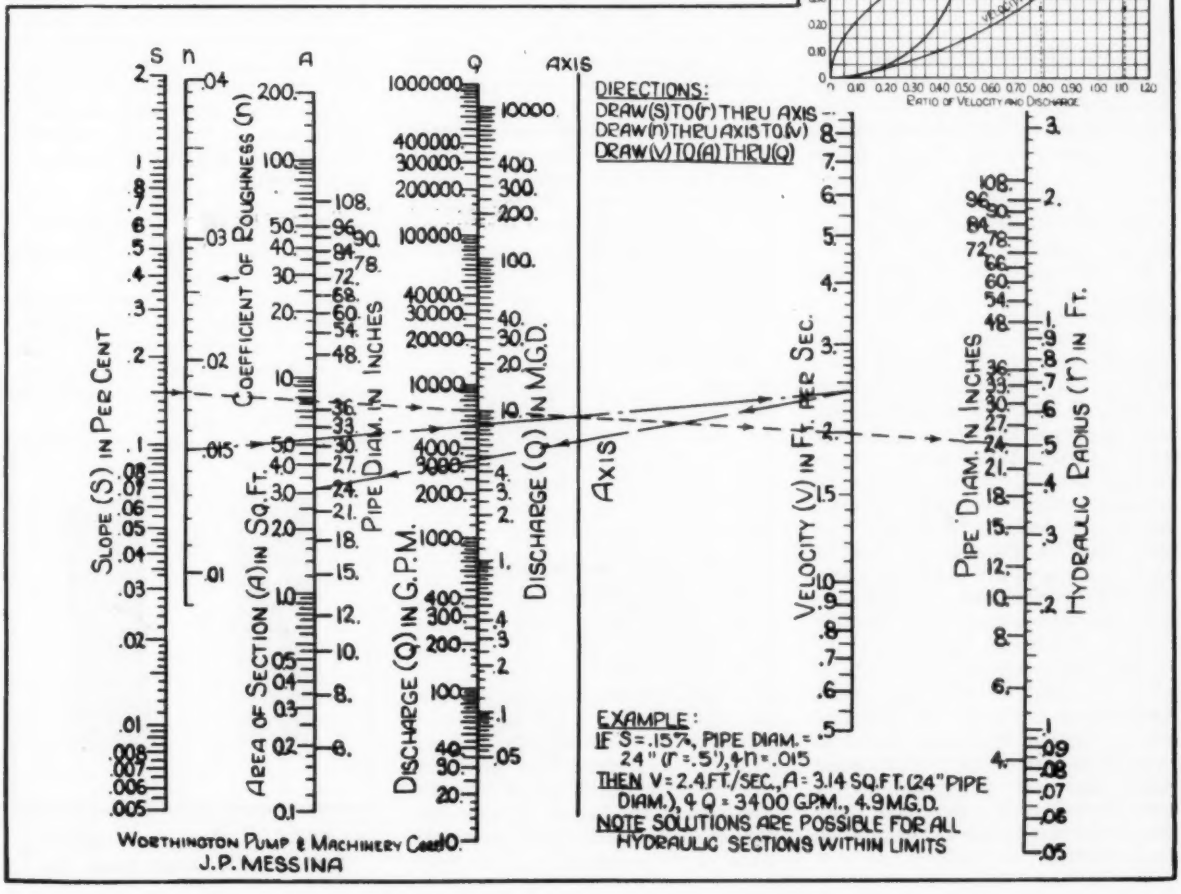
J. P. MESSINA

Worthington Pump and Machinery Corporation

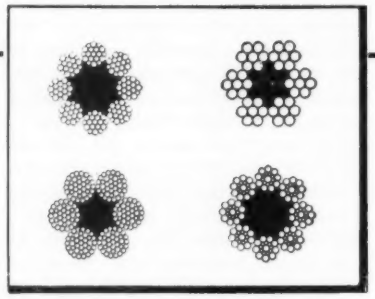
THE hydraulic momograph designated "Solution of Manning's Formula" has been prepared to solve equation $V = \frac{1.486}{n} r^{2/3} \left(\frac{S}{100}\right)^{1/2}$ and $Q = AV$. Solution of the former equation is possible for all coefficients of roughness (n), for all shapes and sizes of hydraulic sections (r = hydraulic radius in feet), and for all slopes (s = slope in %) provided the variables are within the limits of the nomograph. The average velocity (V) is expressed in feet per second and knowing the cross sectional area (A) in square feet the nomograph quickly solves the latter equation and expresses the discharge or rate of flow (Q) in convenient units of gallons per minute (GPM) or million gallons per day (MGD). As a further convenience the hydraulic radii and cross sectional areas of various size sewer pipes are indicated along each of their respective scales. The directions for use of the nomograph are illustrated on the graph. In addition it should be noted that the solution of either equation may be solved in any order provided the required number of variables are known.

Considering the velocity and discharge of a partially full circular sewer, the curve marked "Velocity and Discharge for Partially Full Circular Sewers" has been prepared and based on Manning's formula. This curve is a comparison of the filled section to the full section of the circular sewer. In problems dealing with partial flow the use of this curve eliminates the necessity of calculating the partial hydraulic radius and cross sectional area. If the section is non-circular then the nomograph must be used for the complete solution. For circular sections, however, it is suggested that the full section be solved on the nomograph and the actually filled section compared on the curve. The directions for the use of this curve are illustrated.




S
n
A
Q
AXIS
DIRECTIONS:
DRAW (S) TO (r) THRU AXIS
DRAW (n) THRU AXIS TO (V)
DRAW (V) TO (A) THRU (Q)
Slope (S) in Per Cent
Coefficient of Roughness (n)
Area of Section (A) in Sq. Ft.
Pipe Diam. in Inches
Discharge (Q) in G.P.M.
Discharge (Q) in M.G.D.
Axis
Velocity (V) in Ft. per Sec.
Pipe Diam. in Inches
Hydraulic Radius (r) in Ft.
EXAMPLE:
IF S = .15%, PIPE DIAM. = 24" (r = .5'), & n = .015
THEN V = 2.4 FT./SEC., A = 3.14 SQ.FT. (24" PIPE DIAM.), & Q = 3400 G.P.M., 4.9 M.G.D.
NOTE SOLUTIONS ARE POSSIBLE FOR ALL HYDRAULIC SECTIONS WITHIN LIMITS
WORTHINGTON PUMP & MACHINERY CORP.
J.P. MESSINA

HOW and WHEN TO USE WIRE ROPE



● *TYPES OF rope: top, 8 x 19 and 6 x 7; bottom, 6 x 37 and 7 x 19.*

WIRE rope is used on many varieties of the equipment utilized in public works construction and maintenance, in particular for cranes, shovels and cable controlled scrapers, loaders and bulldozers. Correct selection, proper use and intelligent maintenance of wire rope are essential for good service. This article is based on a series of "Educational Bulletins" issued by the Union Wire Rope Corp., and is published with the cooperation of that company. Illustrations are from the bulletins mentioned above, and data herein apply primarily to Union ropes.

The Kinds of Wire Rope

There are at least 27 popular and generally used types of wire rope construction, each of which is available in several kinds of steel. Ropes may be of mild plow steel, plow steel or improved plow steel. The latter has a strength about 30% greater than the mild plow steel.

Wire ropes consist of wire strands layed helically around a fiber or independent wire rope core. There are four principal types of rope construction suitable for general use—the 6 x 7, 6 x 19, 6 x 37 and 8 x 19. The 6 x 19, which is the most widely used type, consists of six strands of 19 wires each, layed around a core of fiber or wire. This rope, like most others, is made in regular or lang lay, a term which will be described later. The 6 x 19 ropes are made in sizes from ¼ to 2½ inches in diameter. They are used in quarrying and contracting and can be classed as general purpose ropes.

The 6 x 7 ropes have six strands of 7 wires each around a fiber core. Large wires, naturally, are used, and where abrasion is a major factor in rope use, these larger wires wear better than do the smaller wires used in the ropes which have more wires. The 6 x 7 rope is available in sizes from ¼" to 1½".

The 8 x 19 ropes have 8 strands of 19 wires each, with a fiber core. They are made in ¼ to 1½"-inch sizes and are used for relatively light duty service where flexibility to an extra degree is desired. A large core is required; therefore this rope should not be used where crushing is likely to occur.

The 6 x 37 ropes are most valuable where small sheaves and drums must be used and unusual flexibility is desired; however, this rope should not be used with a fiber core under conditions that might cause crushing. With an independent wire rope core in place of the fiber core, this rope is suitable for crane and shovel work.

There are numerous other types of rope, many for special uses, as the 18 x 7 non-rotating rope designed to keep loads from spinning; and the 6 x 42 which is extremely flexible because of the 253 small wires; but which will not withstand much abrasion or crushing.

The "Lays" of Wire Rope

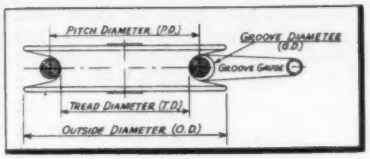
There are two principal "lays" of wire rope, both of which are furnished in right lay and left lay. These are "regular" lay and "lang" lay. The difference between regular lay and lang lay is the position of the individual wires in the finished rope. In the regular lay, the wires are helically layed in the opposite direction to the lay of the rope and the outer individual wires are nearly parallel to the centerline of the rope. In the lang lay, both lays are in the same direction and the individual wires lie at an angle of about 37° to the axis of the rope. Lang lay ropes are more flexible and have a greater wearing surface per wire; however, such ropes are more easily crushed in use and are easily damaged operating over small sheaves.

A right lay rope is layed clockwise so that the strands turn to the right; a left lay rope has strands that lay counter-clockwise. A right lay rope is standard for practically every use in the public works field, but there are a few drum winding conditions where left lay ropes are advantageous. For instance, when winding one layer of rope on a smooth drum, with either an overwind from right to left or an underwind from left to right, a left lay rope is better. With reverse winding, the right lay rope is better.

Factors in Wire Rope Service

Aside from rope construction, there are four factors which influence the life and service of wire rope—rope tension, tread diameter of sheave, groove diameter of sheave, and operating conditions. Rope tension is due to the load placed on

● *BOTH of these are right lay. Left, regular, right Lang lay.*



● ***HOW to measure tread, groove, pitch and outside diameters.***

the rope; excess loading shortens life.

The diameter of the tread or sheave over which the rope passes, if too small, will adversely affect rope life. It is highly desirable that the following tread or sheave diameters, expressed in terms of rope diameter, be followed, 6 x 7, 42 times rope diameter; 6 x 19, 24 to 30 times rope diameter; 8 x 19, 21 times rope diameter; and 6 x 37, 18 times rope diameter. The "critical tread diameter" at which the internal movement and adjustment of the elements of a bent rope results in undue stress, is about two-thirds of these figures.

The groove diameter of a drum should never be less than the actual calipered diameter of the new rope, and the diameter of a rope is the diameter of the circumscribed circle. It is best to caliper both, and to have a little margin of safety—for ¼-inch rope, use 9/32 to 5/16; ½-inch rope, 9/16 to 19/32; 1-inch rope, 1-3/32 to 1-3/16; etc.

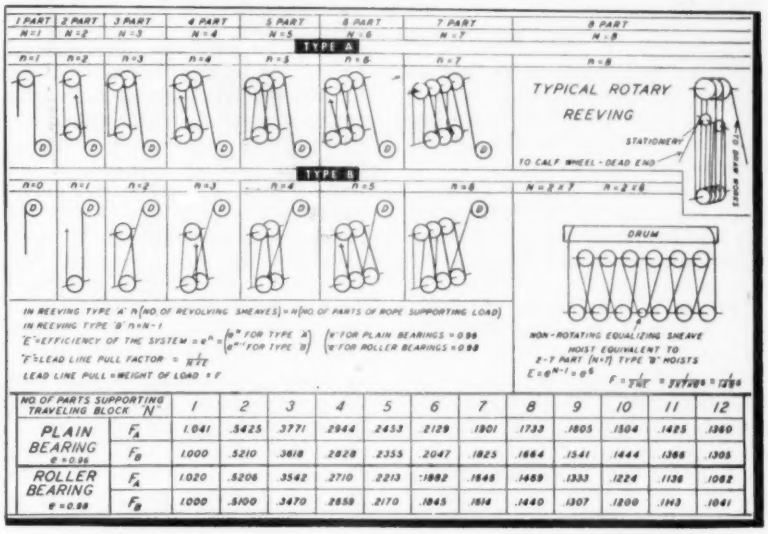
Rope service varies with speed—approximately as the inverse ratio of the square of the speed, other factors being equal. Overstressing, particularly when combined with bending, causes undesirable fatiguing action. Abrasion reduces the area of the load-carrying wires, causes the worn wires to move radially outward, and produces a hardened surface on the face of the wire. All of these factors tend to cause earlier failure of rope.

Corrosion reduces not only the strength, but also the resiliency and elasticity of the rope, making possible a break from a jerk or a load that would be readily carried by a well-lubricated rope. Lack of lubrication increases internal stresses even when corrosion does not occur.

Abuses of Wire Rope

Abuses of and damage to wire rope may occur either during installation or during service. Among the common forms of damage are: Crushing which may result from running the rope over a hard sharp object; the result may be broken or damaged and weakened wires or strands. "Birdcaging" or opening of the twisted strands may result from throwing a loop into the rope, and tightening the kink particularly if the rope is lang lay. Careless storage may permit rusting and corrosion; and in use, the lack of lubrication has similar effects. For instance, a piece of rusty rope was cut into two pieces, one of which was thoroughly oiled. Both were then tested. The oiled section of rope showed one-third greater strength than the unoiled section. A sample of another rope similarly tested showed nearly 50% greater strength after proper oiling. A booklet "Lubrication of Wire Rope" is available on request to the editor.

Reverse bending of rope in opposite directions over sheaves set close together may reduce useful life to 40% of that possible with a properly planned installation. "Crossovers" of rope on a drum, when winding two or more layers, may cause crushing and breaking of strands. Pinching, resulting from a groove that is too small or is badly worn, is practically sure to result in very short life. These factors, and others, including proper breaking in, seizing, etc., are too long to discuss in full here. A booklet "Correct Handling of Wire Rope" is available on request to the Editor.



NO. OF PARTS SUPPORTING TRAVELING BLOCK 'N'		1	2	3	4	5	6	7	8	9	10	11	12
PLAIN BEARING e=0.96	F_A	1.041	.5425	.3771	.2944	.2453	.2129	.1901	.1733	.1605	.1504	.1425	.1360
	F_B	1.000	.5210	.3618	.2828	.2355	.2047	.1825	.1664	.1541	.1444	.1366	.1305
ROLLER BEARING e=0.99	F_A	1.020	.5206	.3542	.2710	.2213	.1892	.1645	.1469	.1333	.1224	.1136	.1062
	F_B	1.000	.5100	.3470	.2650	.2170	.1845	.1614	.1440	.1307	.1200	.1113	.1041

● ***USE this chart to determine actual stresses in wire ropes.***

● ***ABOVE, groove diameter too small; below, groove diameter just right.***

Driving nails or spikes through the rope and pulling out loops, causing "dog legs," are sure to cause permanent damage to the rope.

Safe Working Loads and Rope Stresses

Stationary ropes, such as derricks or stack guys and cableways, should have a factor of safety of 4 or 5. Operating ropes, as those on derricks, cranes, shovels and hoists should have a factor of 5 or 6. Elevators should have a safety factor of 10. Safe working load of a rope is the breaking strength divided by the factor of safety.

In-figuring safe working loads, the actual reeving of the rope over the drum and over all of the sheaves must be considered, since rope is often reeved through several sheaves to obtain a multiplication of power. The chart herewith shows the lead line pulls on the rope or to the drum as multipliers of the load lifted; thus, from the table beneath the chart, the actual stress in the rope can be determined. Two types of

reeving are shown: Type A reeving is with the drum set below the top of the sheaves, as on most shovels, cranes and derricks; Type B reeving is with an overhead drum as with traveling cranes.

For example, you have a 4-part hoisting job, using Type A reeving, and you wish to lift 10 tons. The lead line pull or stress in the rope will be 10 x 0.2944 (shown under 4 in the table at the bottom of the chart) or 2.94 tons.

To determine the number of parts supporting a load, count the number of reeved ropes, including the rope and to the block, but not the rope leading to the drum.

Caring for Wire Rope

When new rope is to be held as a spare, it is best to store it in a dry and sheltered place, free from dust or fumes. When this is not possible, set the reel up on blocks off the ground, cover it with a waterproof covering and keep the grass and weeds around the reel cut. Inspect the rope at least monthly for rust or corrosion.

If there is a shut-down of equipment and the rope is to be kept idle for a considerable period, it should be thoroughly oiled and stored on the drum or on a reel. If left on the equipment, lubricate it thoroughly, which can be done without removing it. Ropes kept in storage dry out quickly; and if it is not possible to lubricate them frequently, a sealing compound should be applied to retain the lubricant.

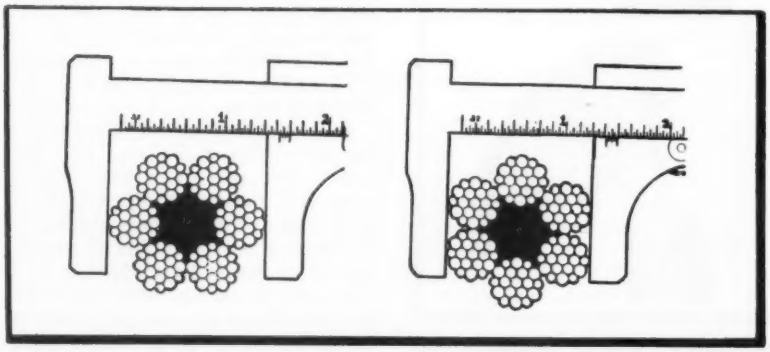
No fixed rule can be laid down as to how often or with what kind of oil the rope should be treated. Service conditions determine these factors. The heavier the duty, the greater the number of bends, or the more corrosive the conditions under which the rope operates, the more frequently will lubrication be required. Lubricant can be applied hot or cold; what is important is that it penetrates to the working parts of the rope and provides a film of oil or grease between the strands and the core.

When getting ready to install the rope, the reel or coil should be so set up as to insure unwinding or uncoiling without kinking or doglegging. Socketing, seizing and clipping must be so done as to assure safety while preserving the full strength of the rope. Special booklets are available on socketing and on splicing.

Getting the Right Rope for Replacement

Before you order rope for replacement, check the equipment to be used to be sure that sheaves and drums are in good condition; then be sure that you get the right kind of new rope for use on the old equipment. First, make sure that the tread or bearing surface of all sheaves is of sufficient groove diameter to avoid pinching the rope. If the sheaves have been used so much that they are corrugated with the rope lay impressions, get new sheaves, for such worn places may greatly reduce rope life. Groove diameters should be at least as large as the actual calipered diameter of the rope, and preferably a little larger. Tolerances on this have already been given. Finally, the tread diameter should be measured. Critical and desirable tread diameters have already been given. For instance, with a 1-inch rope, 6 x 19, the recommended tread diameter of the smallest sheave or drum is 24 times the rope diameter, or 24 ins. The critical tread diameter is 16 ins., and a sheave or drum of less diameter should never be used with this rope.

The safety factor, the load which the rope is to carry and the grade of steel should be selected or determined. The final step is how much rope is needed. This is a measuring job which also must be done carefully. Too little rope is very bad, and too much rope is a waste of money. Like all the other steps in buying and using wire rope, this deserves thoughtful consideration and care.



● ***THE correct way to measure the diameter of wire rope is shown at the left. The method shown at the right is incorrect.***

Consulting Engineers

(Continued from page 36)

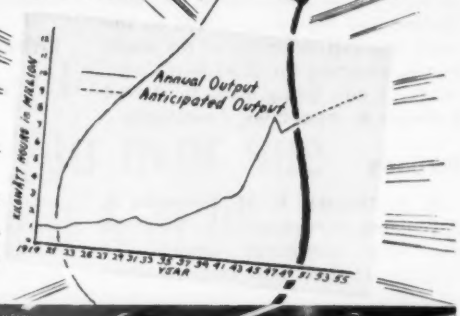
tained **Stanley Engrg. Co.**, of Muscatine, Ia., for sewage treatment plant reconstruction to 1 mgd. **Paul Uhlmann & Associates** of Columbus, O., are designing improved sludge conditioning and aeration facilities for that city. **Wilson & Co.**, Salina, Kans., have designed sewers and a treatment plant for the Kansas Boys Industrial School at Topeka, and will call for bids about the first of the year.

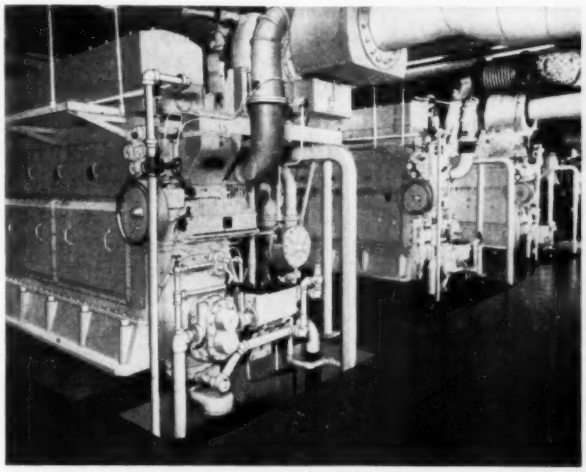
Alamo City Engineers of San Antonio have designed storm sewers for Hondo, Tex., to cost about $100,000. Plans for sewers and for a treatment plant for Shawnee, Okla., have been prepared by **C. H. Guernsey & Co.**, Oklahoma City. **Parker & Hill** of Seattle, Wash., are engineers for a sewer system, lift stations and treatment plant for Woodland, Wash.

Walter G. Attwell, Santa Rosa, Calif., is chief engineer on sanitary sewer design for 12 sanitation districts in Sonoma Co. This will involve 38 pumping stations, 81½ miles of sewer and 13 treatment plants. A joint disposal plant, and trunk sewers for Monmouth and Independence, Ore., are being engineered by **R. H. Corey**, Portland. **Garrett Engrg. Co.**, Houston, Tex., is consultant on a treatment plant for Cleveland, Tex. Additions to the treatment plant of the Philadelphia State Hospital to serve a populatiton of 4,800 have been designed by **H. A. Kuljian & Co.**, Philadelphia, and bids were opened on Aug. 1. Sewers and a sewage treatment plant for Madison, Ind., were designed by **Boyd E. Phelps, Inc.**, Michigan City, Ind. A bay pollution study is being made for Pensacola, Fla., by **Reynolds, Smith & Hills** of Jacksonville. **S. A. Russell**, Rosenberg, Tex., has recently called for bids for a sewer system for Alvin, Tex.

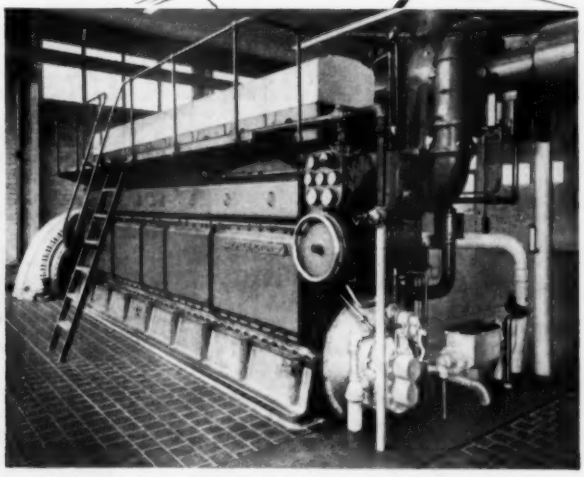
An incinerator has been designed by **Louis P. Booz** of New York for the city of Lackawanna, N. Y., and construction was started in the late summer. **Consoer, Townsend & Associates**, Chicago, have designed sewers and treatment plants for Hamilton and Ashtabula, O., Evansville, Ind., and Negaunee, Benton Harbor and St. Joe, Mich. Bids will

IOWA'S "Best Lighted Town" SETS A PATTERN FOR SUCCESSFUL POWER PLANT EXPANSION





Three of Waverly, Iowa's earlier Worthington Diesels after conversion to supercharging.



Latest Worthington installation in the Waverly Municipal Power Plant. A new Type SEH-8 Supercharged Diesel.

Boasting one of the country's most modern municipal power plants, Waverly, Iowa, has long depended on Worthington Diesels to meet its ever-increasing demands for electric power.

Back in 1938 Waverly installed its first Worthington Diesels, a D-5 and two EE-5's, adding an EE-8 in 1941. During 1947-1948, the speed of the three EE's was stepped up from 327 to 360 rpm, and they were supercharged — *increasing each engine's output 65%!*

Still more capacity was provided in 1949, when a Worthington SEH-8 (Supercharged) was placed in operation, climaxing the Iowa city's eleven-year record of complete satisfaction with its Worthington Diesel equipment. The economy achieved by conversion to supercharging is strikingly proved by latest figures, which show 11.1% gain in kw hrs per gallon of fuel over the pre-supercharged period. And Waverly reports particularly gratifying results from its converted EE-8 and latest SEH-8. During the year ending March 31, 1949, the former produced 14.48 and the latter 14.42 kw hrs per gallon, at engine running capacity factors of 59.2% and 45.6% respectively.

Plan On Lower Cost Power

Far-sighted communities everywhere are profiting by the very real economies of Worthington Diesel performance in power, light and sewage disposal programs. Further facts proving *there's more worth in Worthington* will aid your own planning. Write to *Worthington Pump and Machinery Corporation, Engine Division, Buffalo, N. Y.*

WORTHINGTON

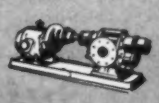
69-2

YOUR PARTNER IN POWER PROGRESS

WORTHINGTON-BUILT AUXILIARIES

Diesel engines, 150 to 3,520 hp . . . gas engines, 175 to 3,520 hp . . . dual fuel engines, 225 to 3,290 hp.

Balanced Angle Compressors



Oil Transfer Pumps

Cooling Water Circulating Pumps

Evaporative Type Engine Water Cooler

be called for during 1950. Plans for sewers and a treatment plant for Bay Minette, Ala., have been prepared by **J. B. Converse & Co., Inc.,** Mobile, and bids were called on the work this fall. A survey of the needs for incinerators for Hamilton County, O., is now being made by **Alfred LeFeber & Associates,** Cincinnati.

Airports

S. G. Wiener, E. M. Freeman & Associates, Shreveport, La., designed the new municipal airport for Shreveport, La. Bids were received last summer. **R. E. Pyle,** Newport News, Va., was consultant on airport lighting for the Peninsula Airport Commission, Newport News.

Other Work

Brown Engrg. Co., Des Moines, Ia., acted as consultant on the power plant addition for Iowa State Teachers College, Cedar Falls, Ia. **L. J. H. Grossart & L. Phaon Grossart,** Allentown, Pa., were designers of the Fountain Hill Borough Recreation Area in Lehigh Co., Pa. Recent additions to the municipal electric power plant at Woodbine, Ia., were designed by **A. S. Harrington,** Omaha, Nebr. Floodlighting of the stadium at Memorial Park, Thomasville, N. C., was designed by **R. D. Tillson,** High Point, N. S.

Steam power plants, or additions to existing plants, have been designed by **Burns & McDonnell Engrg. Co.,** Kansas City, Mo., for Springfield, Ill., Henderson, Ky., Kansas City, Mo., Cleveland, O., and Austin, Texas. **A. E. Heagler,** Pine Bluff, Ark, is consultant on an earth dam and control structures on Little Bayou Meto for the Arkansas Fish & Game Commission. Plans for a power plant addition for Worthington, Minn., have been prepared by **Pfeifer & Shultz,** Minneapolis, Minn.

ANOTHER FEATURE OF
BUILDERS PROPELOFLO METER

Builders Propeloflo Meter is built for a lifetime of accurate, trouble-free performance. All materials of construction are carefully selected: high tensile MEEHANITE® body and cover contribute great strength and durability. Stainless steel ball bearings give long, reliable service with low friction loss. The plastic propeller of high strength, corrosion-resistant Bakelite is moulded in one piece for lasting efficiency.

In design and material no effort has been spared to make the Propeloflo Meter worthy of its name — BUILDERS — that's why the Propeloflo is so widely specified for totalizing flow in main water lines 2" and larger. For Bulletins, address Builders-Providence, Inc. (Division of Builders Iron Foundry), Providence 1, R. I.

BUILDERS PRODUCTS

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BUILDERS PROVIDENCE Instruments

When you need special information—consult READERS' SERVICE DEPT. on pages 69-73.

Adding Fluorine to Water Reduces Tooth Decay

John Hubel

To cut down tooth decay among children, eight Wisconsin cities are now adding fluorine to their water supplies; 29 other cities are planning to do so; and 18 cities are considering ordinances to authorize the procedure. At Sheboygan, where fluorine has been added to the water for the past three years, it is reported that the decay of baby teeth in school children has been reduced 28%, and in permanent teeth 19%. Before fluorine was added, only one-fifth of the younger pupils were free from tooth decay; it is reported that one-third are now without evidence of decay.

Highway Capacities

(Continued from page 27)

pacity from this cause as discussed previously; and (3) commercial vehicles reduce traffic capacity more seriously in hilly country.

Considerable study has been given to the effect of various types of trucks, based on their power-weight ratios and their speeds on grades; and on the effect of long grades. It has been found that, with a 2-lane highway, on a 3% grade, one dual-tired commercial vehicle is equivalent to 3.9 passenger cars on a grade that is 0.1 mile long; and 5.1 passenger cars on a grade that is 4 miles long. On a 6% grade, the comparable figures are 4.2 and 7.6 passenger cars. When the passing sight distance is restricted for 1,500 ft. ahead of the crest of a grade, assuming that typical conditions exist on other sections of the road, the equivalents are 50% to 100% great-

"Hey, Joe! Did you ever see a $100 bolt?"

JOE: "What d'ya mean, a hundred-dollar bolt?"

GUS: "Just what I said. We're raising Number 3 Gate just now and this anchor bolt let go."

JOE: "But we put that gate in less than two years ago, and..."

GUS: "Yeah, I know. But we used ordinary bolts and this one's already rusted through. It'll cost at least a hundred bucks to take that gate out, dig the old bolt out of the concrete and set a new one in."

JOE: "I guess it will. But from here out we don't make that mistake twice. From now on everything that goes in is Everdur."

Most sewage and waterworks engineers have discovered that the most economical way to lick the corrosion problem in their plants is to use Everdur*—ANACONDA's copper-silicon group of alloys. There are plants where equipment made of Everdur has been doing it for over 22 years.

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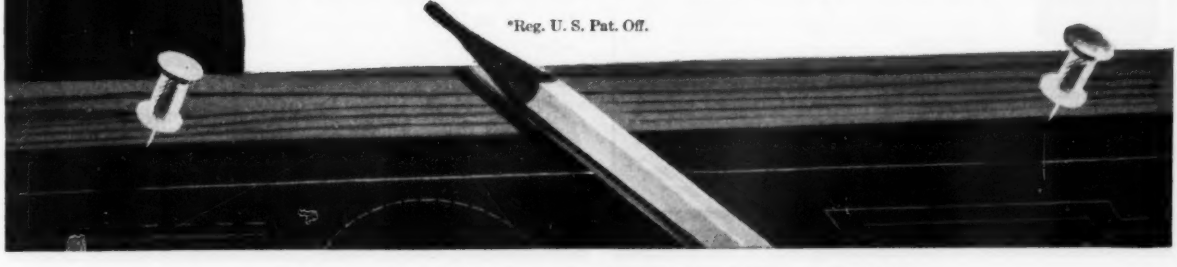

When you need special information—consult READERS' SERVICE DEPT. on pages 69-73.

er. For instance, with a 6% grade, sight distance restricted for 1,500 ft. ahead of the crest, and 60% of the highway with restricted sight distance, one dual-tired commercial vehicle is equivalent to 10.2 passenger cars on a grade 0.1 mile long, and to 14.7 on a grade 3 miles long.

Illustrative Examples

The foregoing data permit intelligent estimates to be made of the capacities of highways having specific characteristics. Herewith are illustrative examples showing the application of these basic data.

Problem—What are the possible and practical capacities of a 2-lane rural highway with: (a) a 20-ft. paved surface; (b) frequent obstructions within 4 ft. of both pavement edges; (c) a location in rolling terrain; (d) 10% of the peak load traffic consisting of commercial vehicles; and (e) sight distance restricted to less than 1,500 ft. for 60% of its length.

Solution — For ideal conditions, the possible capacity is 2,000 passenger cars per hour, and the practical capacity is 900 cars per hour to provide operating speeds of 45 to 50 mph. (See Table 1) These capacities must be adjusted for the various factors cited above.

Surface Width and Lateral Clearance—The combined effect of these two factors is as follows: The possible capacity factor is 0.76 and the practical capacity factor is 0.71. These are based on Table 2 showing effect of lane width, plus an allowance for the effect of restricted lateral clearance on the effective lane width based on the data previously given.

Commercial Vehicle—10% of commercial vehicles will reduce the capacity of multilane roads in rolling terrain to 77% of the practical capacity. To this must be added a factor for the additional effect on the traffic of a 2-lane road, which may be represented in this case by about 87%. This results in a combined factor of 0.67.

Alinement—If 60% of the length has a restricted sight distance, the practical capacity will be reduced from 900 cars to 720 cars. The factor for practical capacity will therefore be 0.80, but the possible capacity remains unchanged.

The products of the above factors will be: For possible capacity, 0.76 x 0.67 x 1.00, or 0.509; and for practical capacity 0.71 x 0.67 x 0.80, or 0.381. With a possible capacity of 2,000 passenger cars per hour for ideal conditions, the possible capacity under the conditions given will be 2,000 x 0.509, or 1,018 vehicles per hour. With a practical capacity under ideal conditions of 900 passenger cars per hour, the actual capacity under the conditions given will be 900 x 0.381 or 343 vehicles per hour.

Another illustrative problem in the report is based on the capacity of the Holland Tunnel, New York, when 10% of the traffic is heavy commercial vehicles. The tube has a 20-ft roadway between curbs, a 1-ft. clearance to the vertical walls at the sides, and a 4% grade. Under ideal conditions, the capacity could be 2,000 cars on each of the two lanes, or a total of 4,000 cars per hour. This ideal capacity is adjusted by a factor of 0.80 for lateral clearances on both sides of two 10-ft. lanes and of 0.77 for commercial vehicles (based on rolling terrain). The product of these two factors is 0.616, and the possible capacity under the conditions that exist is computed to be 4,000 x 0.616, or 2,464 vehicles per hour.

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PUBLIC WORKS DIGESTS

SEWERAGE AND REFUSE..45 • HIGHWAYS AND AIRPORTS..51 • WATER WORKS..55

This section digests and briefs the important articles appearing in the periodicals that reached this office prior to the 15th of the previous month. Appended are Bibliographies of all principal articles in these publications.

THE SEWERAGE AND REFUSE DIGEST

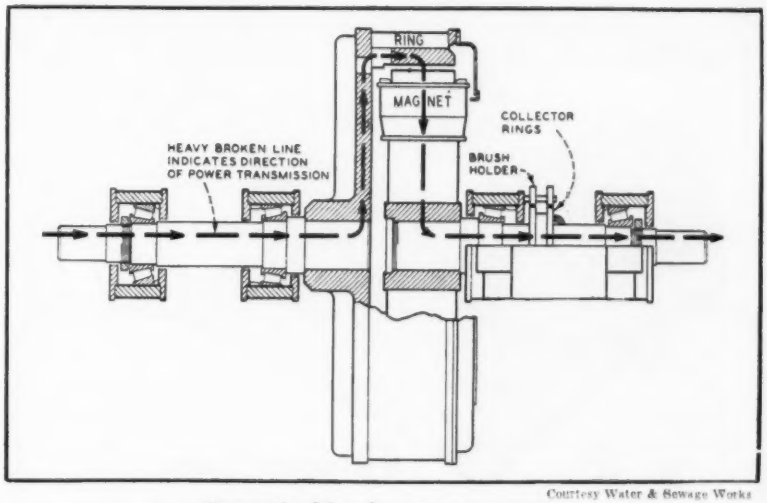
Lagooning in A Small Plant

A treatment plant for 66 families, a hospital and hotel in a western desert area where temperatures fall to 20° below zero will consist of a pumping plant, Imhoff tank, trickling filter, sludge drying beds and a lagoon; there being no stream to receive the discharge. The pumps and filter can be bypassed by lines leading the raw sewage or Imhoff tank effluent direct to the lagoon. There are two lagoons, each 100 ft. square and 4 ft. deep, surrounded by a cyclone fence. These are 2400 ft. down hill from the settlement and an impervious stratum separates them from that from which the water supply is obtained. It will be interesting to note the effect of sub-zero temperature on the operation of the lagoons; however, as the sewage will enter the lagoons at normal temperature, it is believed that only the surface will freeze.

Robert T. Richey—"Sewage Treatment Design for Industrial Housing Expansion"; PUBLIC WORKS, November.

Magnetic Drive For Sewage Pumps

The first installations of magnetic drive for sewage pumps are being made by Worthington at the Nut Island, Boston, treatment plant and two sewage pumping stations in Philadelphia. The Nut Island plant has a capacity range of 35 mgd to 250 mgd, for which there are 4 units provided, one as a spare. By means of the magnetic drive, controlled by potentiometers, the speed of each pump can be adjusted from 140 rpm minimum to 190 maximum. When one pump reaches its capacity an alarm will be sounded and a second unit started manually. This drive gives a stepless speed control.



Courtesy Water & Sewage Works

Magnetic drive for sewage pumps.

In its simplest form the magnetic drive consists of a driving element called a ring that is driven from the motor shaft, and a driven element called a magnet that is attached to the driven shaft. The magnetic drive control is called a regutron, which applies, electronically, the excitation necessary to transmit torque to the driven shaft, and determines the speed at which the driven shaft will operate. For manual operation the amount of excitation is simply controlled by means of a potentiometer mounted on the door of the regutron cabinet.

When the magnetic drive is fully excited the speed of the driven shaft will be about 3% less than the speed of the driving shaft. By reducing the excitation with the potentiometer the speed will be gradually reduced to any desired lesser speed down to ten per cent of normal. For centrifugal pumps a speed reduction of more than 25% is rarely needed.

Herbert J. Meeker—"First Magnetic Drives for Sewage Pumps"; *Water & Sewage Works*, October.

Reducing Septicity of Sewage

Quality of sewage as it reaches a plant is one of the most important factors affecting plant efficiency. The chief problem is septicity. This may be caused by too flat grades, small flows, uneven alignment and grades, and oversize pipe; poorly designed pump wells; and backflooding of

main sewers and resulting reduced velocities. These cause disintegration and liquefaction of solids, resulting in lessened sedimentation and increase in dissolved and non-settleable BOD; early gassification of solids; excessive hydrogen sulfide formation and chlorine demand. Most of these are due to faults in design or construction. To avoid them, adhere strictly to adequate minimum grades; use long lengths of smooth pipe in critical reaches; use smaller than normal pipe on short dead-ends; "built-in" provisions for flushing; provide extra drop at angle manholes and free drop where laterals join large sewers; design pumping plant to maintain greatest possible continuity of station output, and to keep maximum water level in well below incoming sewer; avoid oversize force mains.

Improvement of conditions in an existing system can be obtained by

1. A comprehensive and routine program of sewer flushing—at least in "trouble areas."
2. Use of flush tanks.
3. Introduction of stream flow at strategic points during dry weather flow periods.
4. Improvement and reduction of size of pump wells.
5. Regulation of range of pump well levels.
6. Prechlorination at "upstream" locations.

Elson T. Killam—"Effects of Sewage Quality and Condition Upon Plant Operation and Efficiency"; *Water & Sewage Works*, November.

Building a Sewer Inside Out

Honolulu, Hawaii, is building 1966 ft. of 42" sewer of concrete lined with tile by the unusual method of placing the tile first and pouring the concrete around it. The tile was placed around an inner form, jointed with a synthetic rubber compound and held in place with metal clips. Then the reinforcing steel was placed and the outer pipe forms set, and concrete poured and vibrated. The bid for this was $97,144, while that for precast tile-lined pipe was $122,899.

George C. Wallace — "Honolulu Builds Sewer Inside Out"; *Engineering News-Record*, Sept. 29.

Removing Scum From Cannery Wastes

At Palo Alto, Calif., during the canning season, vegetable wastes amount to 50% of the domestic sewage received at the treatment plant. The chief difficulty encountered in operating the plant was caused by the enormous amount of scum in the clarifier tank. In 1948 the circular cross-flow clarifier was modified to a center-feed clarifier, and a Vacuator was added to help control the scum situation. All cannery wastes are screened at the cannery through a 40-mesh screen. At the plant, the Vacuator and clarifier removed 40% of the suspended solids, except when the wastes were from tomato canning, when 29% was removed. At one time with the Vacuator alone in use on domestic sewage only, the reduction averaged 49.4%, with a B.O.D. removal of 18.9%. The Vacuator fostered scum formation in that unit, where it could be handled, rather than on the clarifier.

R. P. Logan—"Scum Removal by Vacuator at Palo Alto"; *Sewage Works Journal*, September.

Composting Domestic Wastes

Under the heading "Municipal Composting" in the October *Sewerage Digest* a description was given of a method of composting a mixture

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of organic wastes and sewage sludge that is receiving some attention in England. In a paper before a joint meeting of the Institute of Public Cleansing and the Institute of Sewage Purification on October 14th, the manager of the sewage and refuse disposal works of East Ham discussed the method from a practical pounds and shillings viewpoint. He concluded that the method may be advantageous in rural areas where sufficient space is available at the sewage treatment plant and the compost can be delivered to farmers with short and inexpensive haul. Sufficient area of land is not easily available in built-up areas, and there is danger that nuisance may be created. All waste and sludge must be composted, whether there is immediate demand for it or not, and therefore some of it may have to be stored for a considerable time. Also, farmers accept the sewage sludge for fertilizer; it is not known how acceptable to them the compost would be.

Charles E. Burke—"Utilization of Organic Domestic Wastes"; *The Surveyor*, Oct. 21.

Scum on Digestion Tanks

More or less scum is found on practically all digestion tanks. The grease in scum is generally of minor importance and consists primarily of mineral oils. Scum consists chiefly of light, difficult-to-digest materials, which gradually compact due to slow dehydration, the compaction retarding or preventing mixing of the available food with proper organisms. The formation of scum is primarily a physical process. It can most readily be alleviated by proper mixing or soaking devices. Addition of chemicals, such as ammonia or alkalies, may aid in softening the scum and retard compaction and concentration.

Willem Rudolfs and Robert P. Logan—"Cause and Cure of Digester Scum"; *Sewage Works Engineering*, November.

Treating Soluble Oil Waste

So-called soluble oils do not go into true solution, but are homogeneous compositions of oils, emulsifying agents and water. They differ so widely in their components that differences in treatment may be necessary. The oil content may vary from 0.1% to 20%. The higher the oil content, the easier it is to break the emulsion. There are a number of different electrolytes that will partially or completely break emulsions, calcium chloride apparently being

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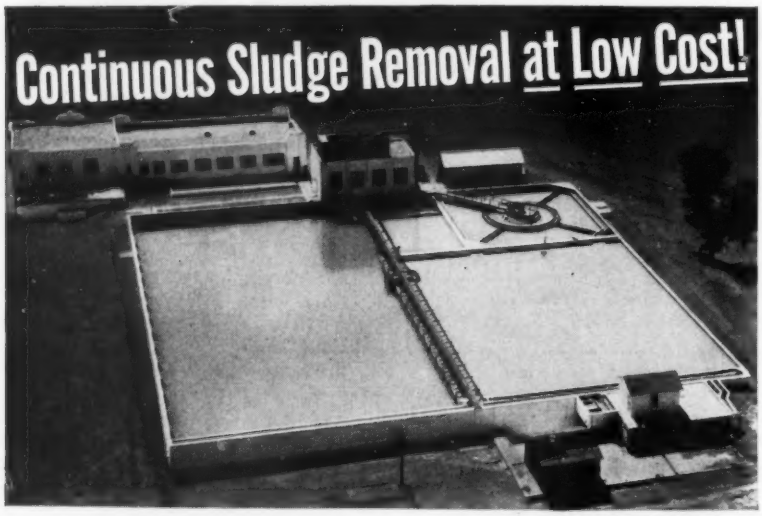
one of the most effective. However, apparently none will break the emulsion completely, and generally the effluent will have an oil content of 200 ppm or more. The addition of alum, ferric chloride or ferrous or ferric sulphate will produce coagulation of much of the oil, but only if alkali is added. Some of the flocculated material may float as scum, the amount of scum decreasing with increased coagulant or addition of bentonite. In some cases it may be desirable first to remove the floating oil in a primary tank before coagulation in a second one.

T. R. Haseltine—"Character and Treatment of Soluble Oil Wastes"; *Sewage Works Journal*, September.

High-Rate Anaerobic Digestion

High-rate anaerobic digestion has been found to be a most efficient method for obtaining high BOD reductions at relatively low cost with trade wastes that have an initial BOD in excess of 500 ppm., a nitrogen-carbon ratio of at least 1 to 20, a high buffer capacity in relation to organic substances that form volatile acids on decomposition; that are relatively free of settleable matter; contain organic matter the major part of which is readily decomposable and the type varied; preferably have a low sulfur content; are in the neutral pH range, and do not contain inhibiting substances. Strawboard waste is one of those that meet all these qualifications and was used in experiments by the authors, which showed digestion at high rates to be possible at temperatures between 25° C and 37°, BOD reduction exceeding 90%, and gas produced high in methane and low in H_2S. Seed sludge settled rapidly and completely, and did not increase in volume appreciably; in fact, it was necessary to retain as much as possible and even perhaps to add more seed sludge at intervals. Direct and thorough mixing of sludge and liquid is necessary. In the discussion, this was said to be true also with yeast wastes from breweries, where the mixing was promoted by introducing the liquid at the bottom of the tank, digestion being accomplished in 1½ days.

Harry W. Gehm and Philip F. Morgan—"A Novel High-Rate Anaerobic Waste Treatment System"; *Sewage Works Journal*, September.



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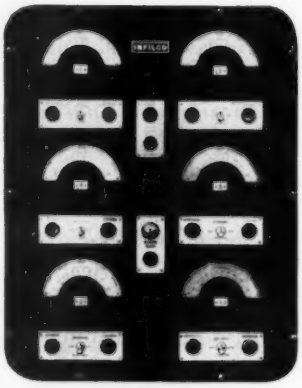

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Compact Sewage Plant for 160 People. By *R. W. Simpson*, San Engr. Nov. 3, Pp. 27-29.

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Sewage Treatment Design for Industrial Housing Expansion. By *Robert T. Richey*, San. Engr., November, Pp. 26-28.

Bacterial Contamination of Tomatoes Grown in Polluted Soil. November, P. 36.

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Soil Test Holes Reduce Risk in Estimating Trunk Sewers. By *Vinton W. Bacon*, Cons. Engr. October, Pp. 84, 86, 88.

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Cause and Cure of Digester Scum. By *Willem Rudolfs* and *Robert P. Logan*, of N. J. Agricultural Exp. Sta. November, Pp. 542-544.

Washington's Treatment Plant Adds Tanks and Digesters. By *Ralph E. Fuhrman*, Supt. November, P. 545.

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Fire Plug Guard

By Elton Sterrett

Overhanging bumpers and horizontal tail gates on trucks are a hazard to fire plugs, many repairs being required during a normal year to plugs which have been damaged or which have been forced loose from their connections by careless drivers.

In the City of El Paso, Texas, plugs close to the curb line are shielded by a piece of heavy angle iron, set so that the two sides form a shield between the plug and the street. The two flanges of the angle

Heavy angle iron guard protects El Paso's hydrants.

form slopes at 45 degrees to the curb, tending to fend off anything which may contact them. The guard shown in the illustration, though but recently repainted with the diagonal black and white stripes which make it easily visible, has much of its paint scraped away by contacting bumpers—most of the wear being on the downstream traffic side, which shows that it is the rear bumper, backing to a parking place, which does the most frequent damage.

The guard is set in a heavy concrete base, and will withstand all but the heaviest crash impact.

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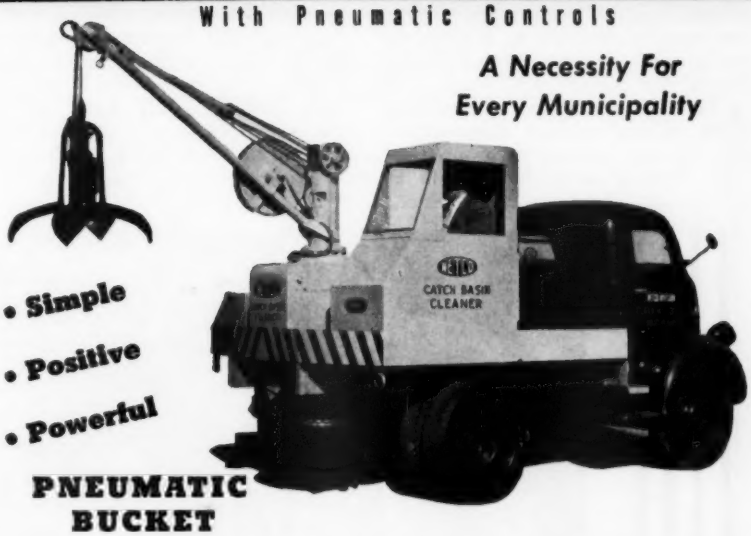

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- **The Netco can be operated continuously because the material removed from catch basins is loaded into other trucks. This unit will average 20 to 30 catch basins per 8 hour day.**
- **The Netco Bucket closes pneumatically, assuring positive and maximum digging efficiency.**
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FLAME cleaning is used effectively for preparing steel surfaces for painting. It can be used on structural steel, tanks, piling, piping and similar surfaces. In addition to its cleaning action, flame cleaning leaves the surface dry, warm and in excellent condition for receiving paint; in fact, the term "flame-priming" may be applied to the process.

In flame-priming, loose scale is removed and rust dehydrated and loosened. As soon as the flame head has passed, the steel surface is wire-brushed and swept to remove the loose material. Paint can be applied as soon as the brushing is completed. The temperature of the steel surface is still above that of the surrounding air so moisture will not form on the cleaned surface. Painting can be done under cold or damp conditions which normally might cause delay. Multi-flame in-line heads are used, ranging in width from 1 to 12 ins. These are easily attached to standard welding blowpipes, either directly or by means of an extension.

A 3-man or 4-man crew does the flaming, cleaning and following painting. One man applies the flame; a second man wire-brushes to remove loose scale; the remainder of the crew paint the surface. The man operating the flame usually has to wait for the brusher and painter. With a 6-inch flame-priming head, relatively clean surfaces can be treated at the rate of 1,000 sq. ft. per hour, while on heavily rusted riveted sections the rate will be about 200 sq. ft. per hour.

Actual figures on recent jobs are as follows: On a relatively clean steel storage tank, having an outside surface area of 10,500 sq. ft., flame-priming required 17.5 hours, the rate per hour being 600 sq. ft. On a steel penstock, badly rusted and pitted, an area of 17,300 sq. ft. was flame-primed in 47 hours, at a rate of 370 sq. ft. per hour. These figures do not include painting.

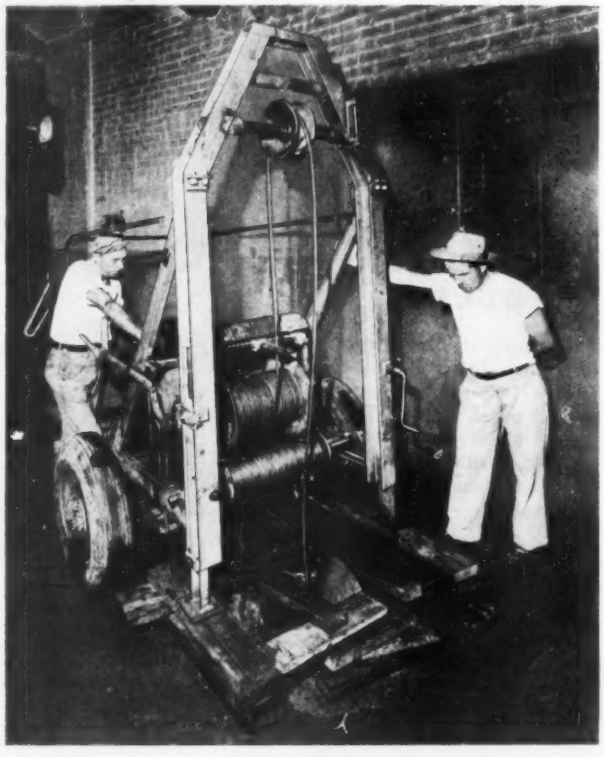
Meter Servicing During Cold Weather

The unusually severe weather during the winter of 1948-49 caused near emergency conditions in the water distribution system of Lewiston, Idaho. The major trouble was caused by the freezing of water meters. It was necessary to put every man on thawing meters and to have a man on duty all night to answer the telephone. There were several days when as many as 110 reports of frozen meters were received. Even with this volume of work, the crews were never more than 8 hours behind. In most cases, it was necessary to remove the meters as the frost bottoms had broken out. This meant that each meter taken out had to be torn down, rebuilt and tested. The costs of this meter servicing program during the cold spell amounted to $6,195.18, of which about 70% was for labor.

Water Used and Accounted For

Water sold through meters in Lewiston, Ida., for the year ending June 30, 1949, amounted to 88% of the total pumped; free municipal water was 4%; and unaccounted for water was 8%. The revenue per service was $32.31 and per 1,000 cubic feet was 91.7¢.

KANSAS CITY BUYS 2ND SET OF "FLEXIBLE" POWER BUCKET MACHINES *(even cleans sewers from cramped basement quarters!)*



Within less than a year from the date Kansas City purchased its first set of Power Bucket Machines this equipment had so completely demonstrated its speed, efficiency and versatility that a second set was ordered—another "on-the-job" proof of performance.

Extreme flexibility of the equipment is shown above. This machine was lowered to the basement of a Kansas City factory in a freight elevator to clean a trunk sewer line. "Flexible" Machines go where the job is and clean lines speedily and at low cost.

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When you need special information—consult READERS' SERVICE DEPT. *on pages 69-73.*

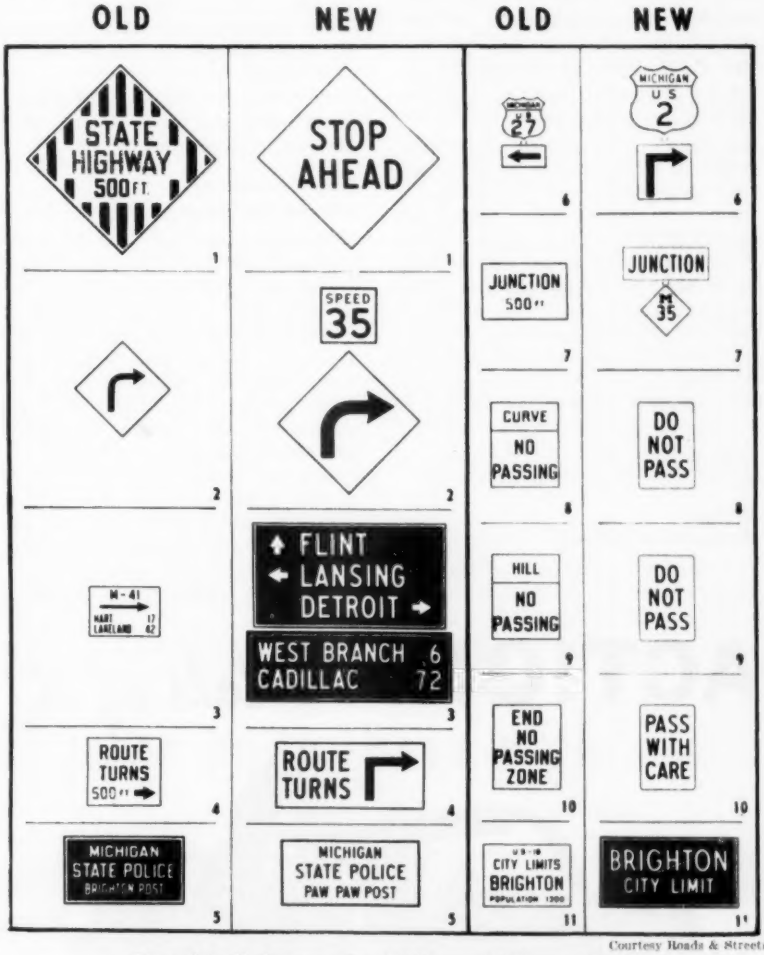
THE HIGHWAY and Airport Digest

PUBLIC WORKS DIGESTS

Re-signing In Michigan

Michigan State Highway Dept. has begun a program of rehabilitating its system of signs on the 2,347 miles of trunk lines by next summer, to be followed by re-signing the remaining 5,950 miles of rural trunklines and 1,100 miles of urban routes. Federal aid will provide half the cost of the 21,000 new signs involved and of erecting them. About 10% of the new installations will consist of old signs repaired and refinished, to be paid from the State maintenance fund. The signs generally conform to the standards set by the national "Manual of Uniform Traffic Devices," but a few have been modified. For example, for ordinary curves a curving arrow is used, but where the curve is sharp or lacks desirable super-elevation, the practical speed for that curve is suggested by an added square panel just above the curve sign. Again, the standard "no passing" sign states whether a hill or a curve is the reason; but as this would appear to be self-evident, the Michigan signs say merely "do not pass" in large letters; and, at the end of the no-passing zone, "pass with care." Signs will be set at least 10 ft. from the pavement edge, with the bottom 7 ft. above the pavement.

J. Carl McMonagle — "Michigan Initiates First Federal-Aid Re-Signing Program"; *Roads and Streets*, October.



Courtesy Roads & Streets

Sign detail changes by Michigan Highway Dept.

Soil-cement For Rural Roads

Madison Co., Tenn., in the late fall of 1947 built 17 miles of soil-cement base and applied an asphalt wearing surface the following spring, after the base had been exposed to a very hard winter. These carry a traffic of about 200 vehicles a day, with no cost as yet for maintenance. The reasons for adopting this type of base were lack of local road-building materials, economy, ease of construction and high freight costs from available aggregate sources. All the work is done by county forces. On 3.6 miles of 6" compacted base 18 ft. wide, done this year, the personnel comprised 23 men, including the superintendent, foreman, equipment operators, truck drivers and labor. The chief items of equipment were a truck-drawn cement spreader, and a single-pass soil stabilizer. Other equipment included a crawler tractor, rubber-tire tractor, two motor patrols, four 2-ton trucks, four 1,000 gal. water trucks, a rubber-tire roller, a sheepsfoot roller, a spike-tooth harrow, a belt conveyor for unloading bulk cement and an asphalt distributor for supplying emulsified asphalt for curing. This 3.6 miles was finished in 8 working days, of which the first 2 were spent mostly on organization of the forces. After operations had got under way the base was processed at an average rate of 1100 sq. yd. an hour. This included unloading, hauling and spreading the 4,190 bbl. of cement, mixing, compacting, shaping and curing. The cost was 20¢ per sq. yd., including charge for equipment, plus 36.6¢ per sq. yd. for the cement.

E. C. Rodgers—"Soil-Cement Fits Rural-Road Needs"; *Better Roads*, October.

Asphalt Sealing of Wichita's Pavements

Since 1943 Wichita, Kans., has followed the practice of sealing its asphalt pavements, which had begun to crack, at the rate of 250,000 sq.

yd. per year, using a rapid-curing asphalt cutback RC-3 and crushed limestone with a maximum size of ½". This treatment is not used to eliminate holes and other uneven places, but prevents water penetration and provides a nonskid surface. The treatment consists of thorough cleaning with mechanical sweepers and flushers; applying 0.25 gal. per sq. yd. of asphalt heated to 200°-225° F.; distributing 15-30 lb. per sq. yd. of crushed limestone; immediately rolled continuously with a 10-ton roller, and at once opened to traffic. If traffic throws much of the chat to the sides and middle of the road, a mechanical street sweeper is used for 3 or 4 days to redistribute it. The same treatment was applied to a concrete pavement, after first applying a coat of 0.15 gal. of MC-1, covering it with sand and opening it to traffic for several days; followed in about 2 weeks by another similar coating; all at a cost of 15¢ per sq. yd.

Geo. J. Fisher — "How Asphalt Sealing Reduces Street Maintenance Costs"; PUBLIC WORKS, November.

Shirley Memorial Highway

This highway, opened in September, extends for 19.15 miles south from Washington, D. C., as an alternate part of U. S. Route 1. It is designed for 70 mph traffic, with maximum 3.5% grades and 3° curves. Two 24-ft. lanes of 10" reinforced concrete are separated by a depressed median strip varying from 14 to 70 ft. wide, which contains drop inlets. Expansion joints are at 90 ft. intervals and contraction joints 30 ft. Mesh reinforcing is used. There are ten interchanges of modified cloverleaf design.

R. I. Mount—"Shirley Memorial a Model of High-Type Design"; *Better Roads*, September.

Fine Cement vs. Coarse for Concrete

Studies made by Kansas State highway engineers of concrete pavements laid both before and after the present fine grinding of cement became popular seemed to indicate that the coarser ground possessed more residual strength than the finer. It seemed probable that the coarser ground cement left unhydrated cement particles in the concreate as reserve to be acted upon as the concrete aged. An experimental highway to test this idea was started this summer south of Topeka, Kansas, with the Lone Star Cement Co. and the Public Roads Administration cooperating with the Kansas engineers. Three kinds of cement are being used: "old-fashioned," ground by open circuit grinding, with 18 to 22% residue retained on the No. 200 sieve, calcination using 80-85% coal and 15-20% gas and a C_3S content between 35 and 42%; "Modern cement," ground by closed circuit grinding with the finished grind between 1600 and 1800 sq. cm. per gram, burned with gas as fuel, and a C_3S content between 45 and 50%; and a cement similar to the modern cement but ground similar to the old-fashioned.

At the same time, different construction methods will be compared. On the sections using old-fashioned cement, curing is by using damp burlap for 24 hr., followed by a covering of wet earth for at least 20 days, and no traffic to be admitted for 10 days more, or possibly longer for truck traffic. The cement content is 1.6 bbl. per cu. yd. of old-fashioned, and 1.4 bbl. of modern cement. The aggregate for some sections has a 1" maximum limit, for other sections a 2".

At the same time a study is to be made of the effect of aggregate size on concrete. In the western half of Kansas the only aggregate obtainable locally is a sand-gravel, the maximum size of particles in which is ⅜". This had been used with the old cement, using more than 6 sacks per cu. yd., but "map cracking" developed. Some experiences have indicated that this can be prevented by adding puzzolan to the cement, and this is being studied in another test road, in which 20 to 25% of the cement will be replaced with puzzolan, of which three different kinds are being used.

W. J. Arndt—"Kansas Engineers to Study Coarse Ground Cement and Puzzolanic Additions"; *Roads and Streets*, September.

Improvements in Construction Equipment

Manufacturers deserve a major share of the credit for the vastly improved performance that fuller mechanization has brought about. This year's machines do more things, and do them better, than last year's; and that next year's will be more efficient and ingenious still we do not doubt.

There are many improvements and new services to be performed that have been suggested by state and county highway engineers as being desired by them. Among them are: faster and more rugged mowing and brush-cutting equipment; a tractor-mounted offset ditcher with

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a reach beyond the road shoulder of 10 ft.; equipment specifically designed for the removal of ice from road surfaces; an efficient machine that will economically dig holes for guardrail posts, and some type of mobile crane, rather flexible and easily moved from place to place, to aid in pruning and removing trees. One county engineer, somewhat in advance of his fellows, said he would like to find a machine that "would elevate earth out of the road ditch, place it exactly where it should be on the roadbed in a well-compacted condition, and turn the top 6 in. of it into a hard, dustless surface with a black stripe down the center-line, which would require no maintenance whatsoever for 25 years."

C. M. Nelson—"Records Will Show the Way to More Efficient Mechanization"; *Better Roads*, October.

To Carry the World's Heaviest Traffic

North Lake Shore Drive, Chicago, carries 80,000 passenger cars and buses every day, occasionally 120,000, traveling at high speed. An asphalt wearing surface on a concrete base laid 22 years ago was replaced in June, 1949, with a surface of asphalt especially designed to carry this traffic. Consideration was given to the high speed and heavy weight of the traffic, and to the softening effect of oil dropping from crank cases and leaky diesel oil tanks. Slight amounts of gasoline will not damage the surface, since it evaporates rapidly, but lubricating and diesel oils will tend to soften the asphalt and increase the bitumen content to a point dangerously lowering the stability and resulting in serious displacement of the surface. It was necessary therefore to obtain an aggregate grading containing a low percentage of voids and maximum density, possessing high inherent stability, as well as a carefully controlled bitumen content capable of being slightly increased by the oil droppings, without affecting the stability and causing a distortion of the surface.

About 1" to 1½" of binder was used, most of it for leveling irregularities in the concrete base, and a 2" surface course laid. The bitumen constituted 4.9% of the binder and 6.2% of the surface. All the aggregate for the binder passed the 1" mesh, 56.4% of it larger than No. 4 mesh; and for the surface, all passed the ½" and 52.6% was larger than No. 10 mesh.

Walter H. Flood—"Paving for World's Heaviest Traffic"; *Roads and Streets*, October.

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Better Roads

Soil-Cement Fits Rural-Road Needs. By *E. C. Rodgers*, County Engr. October, Pp. 31-33.

California Highways and Public Works

Service Town, U. S. A. Outer Highways Enhance Small Town Development. By *J. F. Powell*, District Right of Way Agent. Sept.-Oct., Pp. 1-7.

Service & Supply: Value of Stores Department. By *Richard H. Wilson*, Asst. State H'way Engr. Sept.-Oct., Pp. 30-31, 44-47.

Public Works

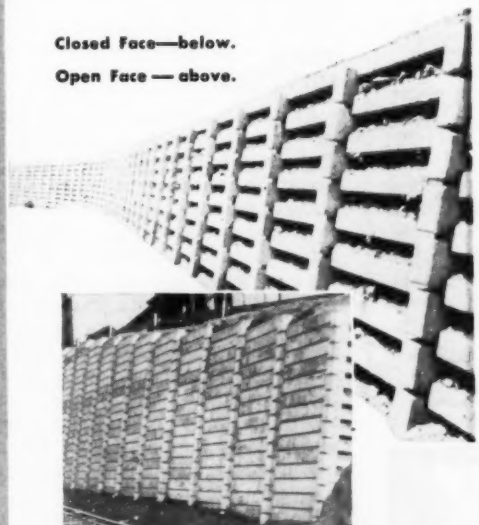
How Asphalt Sealing Reduces Street Maintenance Costs. By *Geo. J. Fisher*, St. Supt., Wichita, Kans. November, Pp. 19-21.

Jefferson, Texas, Builds an Airport. By *J. A. Starling*, County Judge. November, P. 29.

Unskilled labor built these walls

Closed Face—below.

Open Face — above.



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Fast Construction Saves Money. Oct. 27, Pp. 44-46.

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Aerial Surveys for Highway Location. By *Lyle G. Trorey*, Dir. Photographic Surveys. September, Pp. 59-61, 88.

Stage Construction of Highways With Bituminous Materials. By *G. E. Putnam*, Engr., Imperial Oil. September, Pp. 62-63, 90.

Construction and Maintenance of Calcium Chloride Roads in Northern Ontario. By *J. A. Knight*, Engr., Brunner, Mond Casada. September, Pp. 64, 92.

Compaction of Soils as Applied to Road Construction. By *R. M. Hardy*, Dean of Eng., Univ. of Alberta. October, Pp. 78-80, 122.

Uniformity in Traffic Control. By *Charles R. Waters*, Dist. Engr., N. Y. Dept. of Pub. Wks. October, Pp. 81-82, 160.

Three Typical Concrete Bridges. By *D. O. Robinson*, Chf. Engr., Canada Cement Co. October, Pp. 83-84, 88.

Highway Maintenance Problems in Saskatchewan. By *W. M. Stewart*, Chf. Engr., Dept. of H'ways. October, Pp. 90, 118.

Winter Maintenance in Nova Scotia. By *R. W. McColough*. October, Pp. 92, 114.

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Paving for World's Heavist Traffic. By *Walter H. Flood*, Cons. Engr. October, Pp. 55-57.

Emulsified Asphalt: Methods Using Road Mix Machinery. By *Al Day*, Chf. Engr. Bitucote Products. October, P. 58.

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A procedure for Designing Flexible Pavement and Base Mixtures. By *V. J. Brown*, Assoc. Ed. October, Pp. 60-63, 81.

The Surveyor (England)

Riding Quality of Road Surfaces. By *A. C. Hughes*, County Surveyor. Oct. 14, Pp. 615-617.

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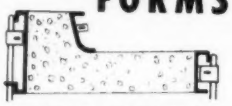
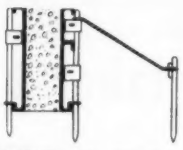


CURB AND GUTTER FORMS. For combined concrete curb and gutter when curb is battered.



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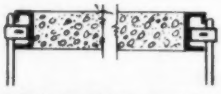

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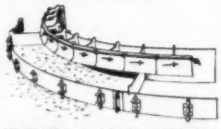

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BOOK REVIEWS

ENGINEERING HANDBOOK

A new edition of the De Laval Engineering Handbook has been published. There are six general sections: Mathematical, fluid and general information, 100 pages; steam turbines, 48 pages; pumps, 45 pages; IMO pumps, 11 pages; centrifugal compressors, 30 pages; reduction gears, 15 pages; and worm gears 14 pages. It is a good text on design, installation and operation. Copies are $2 from Advertising Dep't., De Laval, Trenton 2, N. J.

FAMILY HOUSING:

Though the language and illustrations in this book are directed toward the non-engineer, the technical man can learn a good deal from it. The illustrations ought to be studied by engineers, and adopted in reports and articles to a very considerable extent. Specifically, however, this book is a step-by-step analysis of home planning, and attempts to explain everything from building to remodeling and from fire-safety to farmhouses. By Deane G. Carter and Keith H. Hinchcliff. John Wiley & Sons, Inc., New York 16, N. Y. 265 pp. $4.

ROUTE SURVEYING:

This is the third edition of a well-known and widely used book. Though the general character and make up remain the same as in earlier editions, there have been extensive changes. There is excellent information on highway and railroad surveys, and on maps, plans and profiles. Late data on diesel and electric locomotives are included. Of particular value to the average engineer are the numerous useful tables. In addition to the usual tables of earthwork are the new seven-place tables of the natural trigonometric functions, replacing the old five-place tables; and a table of secants and cosecants has been added. The book is pocket size and contains 434 pages. It is published by John Wiley & Sons, Inc., New York 16, N. Y., and sells for $4.75.

PUBLIC WORKS DIGESTS

THE WATER WORKS DIGEST

Subdraining A Reservoir

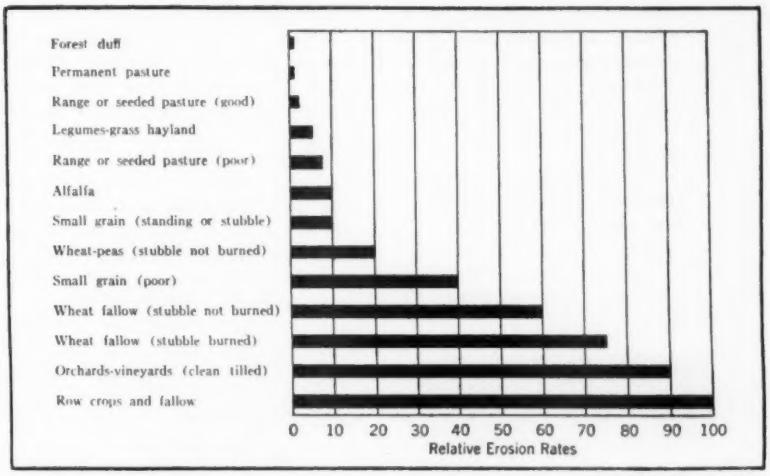
Glendale, Calif., is building a 3.8 mg reservoir on a side hill with concrete walls and slab roof, divided by a wall into two halves. The roof is supported by 35 concrete columns on footings 7 ft. square. Subdrains are located under all contraction joints and foundations, which will relieve any upward water pressure and also permit the location of any leak through the floor. Each drain is provided with an inspection pipe 150 ft. below the bank, by which any leakage can be detected and located. Subdrains are also provided along all supply lines into the reservoir to permit leak detection. Drains around the outside of the tank will collect and remove any surface seepage. Altogether there are more than a mile of 4" and 6" vitrified clay drains, laid with calked joints.

"Efficient Concrete Plant Design Helps Build California Reservoir": PUBLIC WORKS, November.

Siltation Of Reservoirs

Recent studies indicate that, at least in the mid-western states, more than 33% of the water supply reservoirs will have to be supplemented or replaced before they are 50 years old, because of their loss of capacity through siltation. Methods that can be used to control silting include debris basins above the reservoir, bypassing sediment-laden flood flows, venting density currents through outlets in the dam, and dredging. Their cost per unit of storage conserved is generally excessive; for most reservoirs the only practical solution is the protection of watershed lands and water-courses against excessive erosion. A factor in evaluating the effectiveness of watershed treatment is the fact that the rate of sediment production per unit of watershed area decreases with increasing watershed size, and the annual rate of storage loss decreases with an increasing ratio of storage capacity to watershed area.

Protection of agricultural watersheds may be by land use, cropping practices, and by channel stabilization and retardation of water flow by structures. The illustration shows relative rates of erosion under different land uses, with all other factors equal. Rotation of crops also is desirable; a good 3-yr. or 4-yr. rotation will give an average soil loss only 14% to 45% of that caused by continuous one-crop cultivation. Contour plowing and strip planting has reduced erosion an average of almost 75%. Terracing is particularly effective.



Courtesy Journal AWWA

Relative erosion rates for different vegetal covers.

On many watersheds, upstream engineering is necessary. This includes works to stabilize channels, retard channel flows and impound sediment at widely distributed points throughout the watershed, by means of small earth and concrete dams, diversion ditches and dikes, minor floodways, realignment, bank protection and gully stabilization.

Carl B. Brown—"Watershed Control"; *Am. Water Works Ass'n Journal*, October.

Bacteria in Cation Exchangers

Both siliceous and resinous exchangers may become contaminated with bacteria filtered from the water supply. Although experimental evidence indicates that the siliceous and resinous exchangers are incapable, in themselves, of sustaining bacterial growth, bacteria may grow in the softener material because of the presence of filtered organic matter, especially during optimum temperature conditions. These bacteria are chiefly soil organisms which may be of extreme nuisance value through fouling of the exchanger and the formation of objectionable tastes and odors. Coliform organisms are infrequently found in municipal supplies but may occur in private well supplies.

It has been found that such contamination of exchangers can be effectively controlled by sterilizing the softening unit at the time of regeneration, after backwashing. Siliceous catioh exchangers can be effectively disinfected during regeneration by the application of calcium or sodium hypochlorite. Since the sulfonated phenol-formaldehyde cation-exchange resins removed chlorine, and were oxidized by the usual chlorine compounds, it was necessary to find a compound which would effectively disinfect these resins without injury to the resin.

A new sterilizing agent, chloromelamine, has been found to be very effective, economical and simple to apply in disinfecting both the sul-

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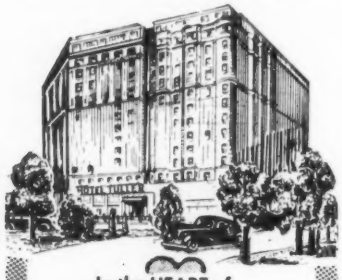

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fonated phenolformaldehyde and sulfonated polystyrene cation-exchange resins, as well as the siliceous exchangers, during the regeneration period, without deleterious effect on the exchanger.

George H. Klumb — "Control of Bacterial Reproduction in Cation-Exchange Layers"; *Am. Water Works Ass'n Journal*, October.

Control of Water Quality

A panel discussion of "Factors Involved in Control of Water Supply Quality," to which five state health department engineers contributed, brought out many ideas on the subject. Arthur D. Weston, in Massachusetts, firmly believes that "the time has arrived for evaluating sanitary engineering practices in connection with public supplies. Before adopting procedures which may prove to be a great financial burden on the water consumers, it must be shown that such practices have a real bearing on the public health. . . . Attention should be centered on simplifying rather than complicating water works practice." He warns against "the establishment of unreasonable standards and requirements for water works."

Charles R. Cox, New York, said "The great majority of public water supplies are of safe sanitary quality. . . . Most of the current waterborne outbreaks are a gastroenteritis, occurring in summer resorts, institutions and the like. . . . No typhoid fever has been spread by public water supplies in the state since 1928, except for the Rochester outbreak in 1940. Only four outbreaks of waterborne gastroenteritis due to public water supplies occurred during the period 1938-45," three due to temporary lapses in chlorination and one to a cross-connection. "Future developments in water supply practices must be predicted upon broader grounds than water quality itself."

Speaking from Alabama, Arthur N. Beck says that a few small supplies do not have adequate treatment facilities, but with one exception there has not been an outbreak of any disease traceable to a public water supply since 1923.

David B. Lee, Director of Florida's Board of Health, calls attention to the fact that, in a region of permeable limestone, it must not be assumed that all well waters are safe; they may be polluted by surface water and by discharge of sewage underground, a practice which is being discontinued as rapidly as possible in Florida. "The Florida Health Department has been criticized for frank, factual replies to inquiries from the press. . . . The department refuses to gloss over or cover up any potential hazard—even if one or more factors necessary to create an epidemic are not yet present."

In the opinion of T. A. Filipi, of Nebraska, "The so-called standards are not to be used as a goal but as a means toward a goal." Bacteria associated with filth have no place in drinking water, why be satisfied by meeting certain standards that allow a given percentage of samples to be contaminated? The best possible product should be developed, even though it exceeds accepted minimum standards.

"Factors Involved in Control of Water Supply Quality"; *Am. Water Works Ass'n Journal*, October.

Insurance for Water Departments

Because, in the opinion of the courts, there is no material difference between public and private ownership of a water utility when responsibility for public liability and property damage claims is concerned, every water utility should carry some form of contractors' liability insurance to protect itself from serious losses arising from these claims. The larger utilities perhaps do well at least to carry catastrophe or excessive-loss coverage in conjunction with budgetary provisions for self-insurance coverage for the smaller claims; the smaller utilities might better carry complete coverage.

Most claims are small "nuisance" ones—tripping over curb, valve or meter boxes, etc.—some of which can be settled for as little as $15. In Indianapolis, during the 18 years 1931-48, curb boxes were involved in 57 claims filed, meter pits in 41 claims and valve boxes and fire hydrants in 9.

Charles G. Bourgin and Elmer C. Schwier—"Insurance Protection for Municipal Water Departments"; *Am. Water Works Ass'n Journal*, October.

Removing Colloidal Clay Turbidity

Kennebunk, Kennebunkport and Wells, Me., obtain their water supply from Branch Brook, which normally has low solids content and high color. Early in 1946 excavation for highway construction about a mile upstream from the intake caused the run-off to the brook to carry large quantities of colloidal clay; which is so unsettleable that after a quart of the water had stood for a week it was still opaque, and it was not removed by filtration. The cities served are summer re-

sorts and a cure before June 1st was urgently needed. None of the many dosages of alum and alkali tried was effective. Then tests were run with activated silica as a coagulant aid and the result was startling: with dosages of 2 gpg of alum and 0.5–1.0 gpg of soda ash, the addition of 5 ppm of activated silica caused a large, shaggy floc to form, which settled quickly and left a clear, colorless supernatant. Operating experience has shown that the optimum pH range is 5.8–6.2, and the activated silica was most effective when added about 5 min. after the alum and soda ash. It had been planned to use a sludge contact reactor, but the equipment could not be obtained soon enough, and a conventional flocculation and settling plant was installed. The supply is prechlorinated, alum and soda ash flash-mixed, activated silica fed, and the water flocculated for 30 min., and passed into a settling basin giving 3 hr. detention, and then is pumped through pressure filters filled with anthrafilt. The plant, designed for 3 mgd, was in partial operation within 6 months from the start of laboratory tests and in full operation within 8 months, delivering a clear, colorless water at all times.

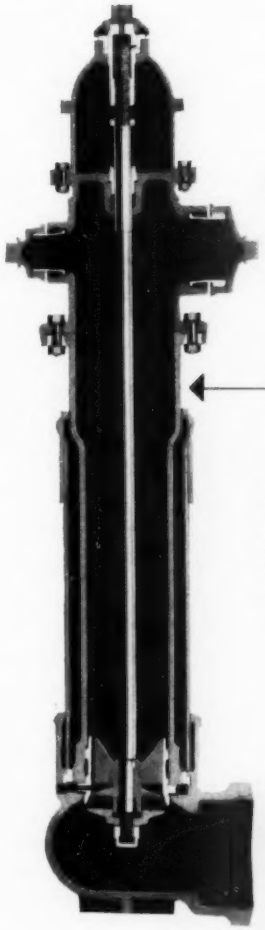
The activated silica is prepared continually by mixing a sodium bicarbonate solution with a sodium silicate solution and diluting the mixture to a concentration of 0.75-1.0% silica, which is then aged for 1 or 2 hrs. before being added to the water.

M. Lane and L. G. Smith—"Solving a Difficult Clarification Problem at Kennebunk, Maine"; *Journal, New England Water Works Ass'n*, September.

Diatomite Filters For Swimming Pools

In 1948 three diatomite filters were installed for treating the water of a 500,000-gal. swimming pool at the University of Florida. Each filter contains 62 septums or filter elements with a total surface area of 80 sq. ft., and was designated to operate at 4 gpm per sq. ft. The filters were tested by running them at various rates and numerous changes in procedure. The filter aid used was Celite 545, the coarsest grade of diatomite produced by Johns-Manville. The general conclusions were that this type of filter offers many advantages for swimming pools where the circulated water has low turbidity; and that they give as good results as do rapid sand filters if the operation is equally competent. Further experiments will be made using a fine grade of diatomite and other types of filter aids.

Throughout the tests the filters were practically 100% efficient in removing turbidity. On several occasions the diatomic coating was purposely released from the filter elements and turbid water came through but became crystal clear in 30-90 seconds. The filters are not intended to remove bacteria, a chlorine residual of 0.2 ppm being maintained; but when chlorination was intentionally discontinued the filters removed from zero to 96% of the bacteria. Body feeding of filter aid was not necessary at low rates of filtration but might be at high rates. The amount of filter aid required is much less at low rates than at high, though this saving in cost may more than compensate for the cost of the larger filter required for low rates. The filtration rate of 3-4 gpm per sq. ft. was low enough at this plant; 9 gpm was much too high. On several occasions filter cake which had been dropped from the



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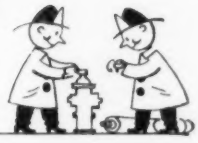

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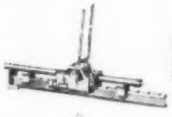

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elements when shutting down was reused satisfactorilly without any treatment, but this should not be permitted unless a good chlorine residual is maintained.

John E. Kiker, Jr.—"Diatomite Filters for Swimming Pools"; *Am. Water Works Ass'n Journal*, September.

Protection Against Activated Carbon Fire Hazard

At Cleveland's Nottingham filtration plant, activated carbon is stored in 8 rooms, fed in a 9th and charged in a 10th. Fire protection is afforded to all of these by a four-phase system. Each room contains thermostats which, if the temperature rises much above normal, signal a central station visibly and audibly. Smoke detectors continuously draw samples of the atmosphere to smoke analyzer tubes at the control station and detection of any smoke results in an audible alarm and visual signal. Then carbon dioxide is discharged from cylinders, by manual release, into the room where fire is indicated. A meter indicates if the CO_2 concentration in the atmosphere in the room falls below that required to smother a fire, and if it does more gas is discharged. The smoke-sampling line is used for supplying the CO_2, and this, as it discharges, releases self-closing fire doors.

W. E. Morgan, Jr.—"Four-Phase Fire Protection Will Guard New Nottingham Filtration Plant"; *American City*, October.

Wastes From Softening Plants

Sludge from the lime-soda softening process consists principally of calcium carbonate and ferric, magnesium and aluminum hydroxides. About 2.5 lb. of dry sludge is produced for each pound of commercial quicklime added. The solids content of sludge varies in different plants from 5% to 33%. For disposing of it, of 371 plants, 217 discharge it into watercourses, 110 onto sludge beds or lagoons, and 33 to sewers. Other methods that offer attractive possibilities are: 1—Utilization as a precipitant in primary sewage treatment; 2—drying and pulverizing for a variety of industrial uses; 3—dewatering and calcining in small stationary kilns or (4) in large installations, in rotary kilns.

A. P. Black—"Lime and Lime-Soda Sludge Disposal"; *A.W.W.A. Journal*, September.

Wastes from sodium zeolite softening plants consist principally of chlorides of calcium and magnesium,

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with small quantities of various compounds of iron and manganese. These solids can not be removed entirely by ordinary water treatment methods. If the waste is discharged into sewers it may corrode pumping equipment and upset biological phases of sewage treatment. Discharged into streams, it may kill fish and vegetation along the banks and be injurious to cattle and other animals that drink it, unless amply and quickly diluted. Solar evaporation seems to be impracticable in most cases. Uncontrolled dilution is not permissible unless there is ample dilution at the time of brine discharge during periods of minimum stream flow. Providing storage reservoirs for holding the waste water, and discharging it at such rates as will at no time exceed the ability of stream or treatment plant to dilute it satisfactorily seems to offer the most generally applicable means of handling these wastes, but only if there is ample dilution water and the releases are carefully controlled. Brine disposal wells may offer a satisfactory solution if the volume of wastes is large and the subsurface geology suitable for underground disposal.

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PUBLIC WORKS
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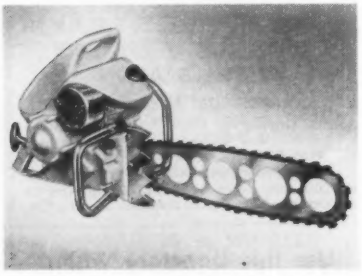
Chain Saw for Many Types of Work

A 25-pound chain saw with 3-hp. air cooled engine, has ample power for all kinds of tree and timber cutting: It is available with 18-inch or 24-inch straight blades or 14-inch bow saw blade, which will cut small timber in any position or location without pinching or prying. The power unit is the same for all three saws. Write for data to McCulloch Motors, Los Angeles, Calif., or use the coupon.



Chain saw weighs 25 lbs.

Use coupon on page 69; circle No. 12-1

Swing Loader for Municipal and County Work

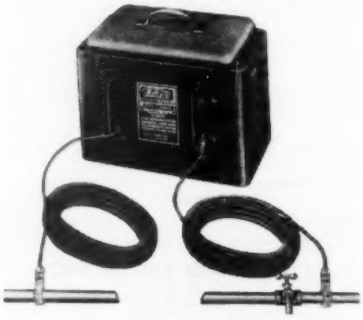
Full hydraulic operation and ability to swing 90° to either side to dump or place a load are features of the new Mandt swing loader. It will work within 2 ft. of a truck; and it can be used for numerous jobs in the street, highway or water department. The standard bucket is ¾-yd.; a 2-yd. snow bucket is available. Catalog and full information from Mandt Mfg. Co., 490 W. Goodale St., Columbus 8, O., or by using coupon.

New Mandt swing loader.

Use coupon on page 69; circle No. 12-2

Thawing Those Frozen Pipes

You can thaw copper and lead pipes as well as iron pipes with this equipment. It has a thermostatic control which permits automatic regulation of temperatures. It is simple to operate, and will thaw a 1½-inch pipe 30 ft. long in a few minutes. Also, it is useful for heating fluids in pipe lines to promote flow or for other purposes. Write Trindl Products, Ltd., 17 East 23rd St., Chicago 16, Ill.



Easy to thaw pipes.

Use coupon on page 69; circle No. 12-3

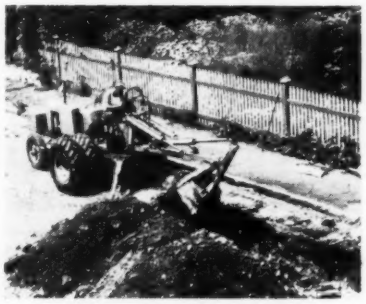
Plastic Rock for Better Sidewalks

City sidewalks, especially those with vault space below, deteriorate and need repairs. Plastic rock is a compound that can be applied easily with unskilled workmen, without heavy equipment, over such vaults, leaving a smooth and weatherproof surface. For information on this material and how to apply it, write United Laboratories, Inc., 16814 Euclid Ave., Cleveland 12, O., or use the coupon.

Use coupon on page 69; circle No. 12-4

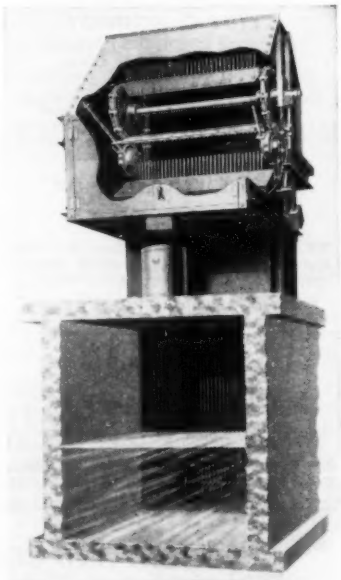
Hydro-Trencher for Quick Trenching

The hydro-trencher is an inexpensive unit which can be installed on either the 77 or the 80 Oliver wheel tractor for trenching for water or sewer lines (or other purposes). It also can be provided with a conventional shovel bucket so that it can be used for loading materials as well as trenching. Write Oliver Corp., Cleveland, O., or use the coupon.



Trencher for Oliver tractor.

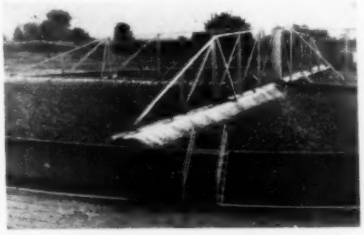
Use coupon on page 69; circle No. 12-5



This is the new Link-Belt Thru-Clean bar screen designed for water sewage and industrial waste treatment.

PFT Non-Clogging Jets for Sewage Distributor

The 166-ft. distributor shown herewith is installed at the Stockton, Calif., plant, where it is handling 12 mgd., or 20% more than the de-



New jets for filters.

sign flow. Sewage contains a high percentage of cannery wastes. The distributor is equipped with PFT removable spreader jets which minimize clogging and are easily cleaned. For information on these jets write Pacific Flush Tank Co., 4241 N. Ravenswood Ave., Chicago, Ill., or use coupon.

Use coupon on page 69; circle No. 12-6

The New International Trucks

A completely redesigned and re-engineered line of motor trucks has been developed by the Motor Truck Division of International Harvester Co. There are 87 separate truck chassis models for all kinds of work, and in capacities from 4,200 to 40,000 pounds gross vehicle weight. The cabs on these new models are roomy and have many conveniences for

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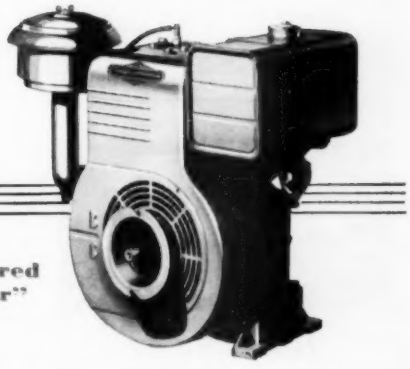

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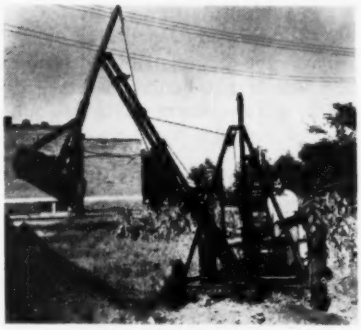
driver comfort and efficiency. The windshield is one-piece, curved, with blind spots greatly reduced.

Wheelbases have generally been shortened to increase maneuverability and improve turning quality. The new engines are 6-cylinder, valve-in-head, with compression ratio of 6.5 to 1 for the lighter engines, and slightly less for the bigger power units. These new units can be seen at local dealers, or full information is available from Motor Truck Division, International Harvester Co., 180 North Michigan Ave., Chicago, Ill., or by using the coupon.

Use coupon on page 69; circle No. 12-7

Light Ditcher Will Excavate 100' Per Hour

A trailer-type, hydraulically operated backhoe, this unit can be attached to any type of tractor that has a power take-off. Attachment time is 1 minute. It is claimed to excavate 100 ft. of 4-ft. trench an hour and to handle 25 yds. of material. Fine for in-between jobs where hand work costs too much and a big machine is not required. Uses any type of tractor. Full information from Badger Machine Co., Winona, Minn., or by using the coupon.



Badger light ditcher.

Use coupon on page 69; circle No. 12-8

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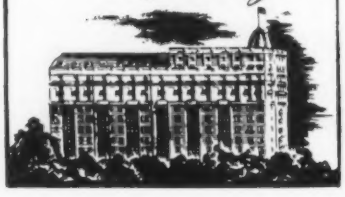

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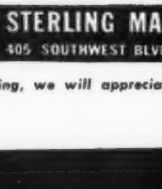

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Use coupon on page 69; circle No. 12-9

Wayer tamper and packer.

Removes Pavement Surface Irregularities

The heater-planer removes surface irregularities in bituminous pavements; may eliminate the necessity for a leveling course and cleans the surface in readiness for any further treatment. The long wheelbase assures the removal of waves and bumps, the asphalt or tar being heated only to the point of working softness. The heater-planer is not sold, but is furnished by the manufacturer for the job. For information write Pavement Planing Co., 259 West Third South St., Salt Lake City 1, Utah, or use the coupon.

Use coupon on page 69; circle No. 12-10

Concrete Pavement Cutter

Continuous or intermittent, straight or curved cuts for street repair, water and sewer excavations, and other purposes, can be made with this cutter. It cuts 10 ft. per minute 1 inch deep and other depths at corresponding rates. Maximum depth of cut is 6½ ins. Cuts sidewalks for widening, also. Write Ottawa Steel Products, Inc., Ottawa, Kans.

Use coupon on page 69; circle No. 12-13

Featherweight Electronic Pipe Finder and Leak Detector

Weighing only 9 pounds, this unit will show the exact location of buried pipes, services, gates, fittings, etc. Gives depth as well as location of pipes. Also finds leaks in pipes. Standard material tubes and batteries are used. Write Goldak Co., 1545 W. Glenoaks, Glendale, Calif., or use coupon.

Use coupon on page 69; circle No. 12-14

In-Service Training in Air Pollution

A short course in air pollution control will be presented by the University of Michigan, Ann Arbor, Mich., Feb. 6, 7 and 8. This course is intended to serve personnel engaged in control of air pollution, industrial chemists, engineers, health officers and industrial hygienists.

Position Wanted as assistant city manager or on staff of city manager by civil engineer graduating with sanitary option in December. Write RMB, c/o The Editor.

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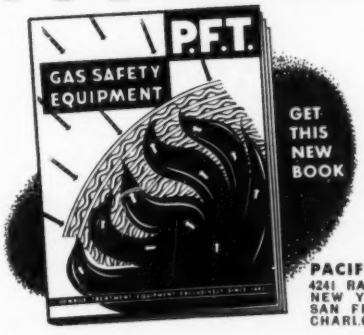
HIGHER SAFETY STANDARDS



New Bulletin 221 describes the recent improvements in P.F.T. Gas Safety Equipment; for better protection for boiler rooms and other installations, and longer service life for the equipments.

All units are illustrated with detailed drawings. Specifications, typical gas piping arrangements and charts for selecting sizes are included.

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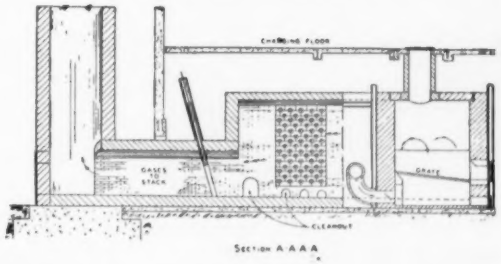

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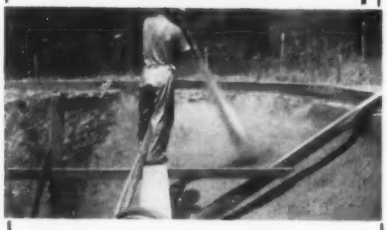

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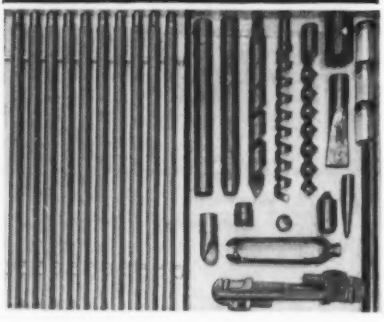

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● *Send for Bulletin 26*

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NEW LISTINGS

Pipe Thawing by Electricity Eliminates Fire Hazard

26. Learn how to thaw frozen pipes quickly, easily and safely with the Trindl portable pipe thawer. Light-weight unit passes 200 to 500 amps. through frozen water pipe. Full data from Trindl Products, Ltd., Dept. PW, 17 East 23rd Street, Chicago 16, Ill.

How to Install Clay Liner Plates

89. A new 6-page pamphlet shows in detail the joining, bonding and anchoring of clay liner plates for concrete pipe and masonry sewers, drains, sewage treatment tanks and other projects. Copies available from Robinson Clay Product Co., 65 West State St., Akron 9, Ohio.

Manual on Modern Sewage Treatment Processes

123. This treatise on "Modern Processes and Equipment for Sewage and Industrial Waste Treatment" outlines all major treatment processes and illustrates flow diagrams and equipment, together with valuable information on typical plant operating results. A really useful addition for the engineer's library. Copies of Manual #149 available from Dept. PW, American Well Works, Aurora, Ill.

Versatile Maintainer Has Year 'Round Usefulness

151. A new bulletin shows how the sturdy Huber Maintainer will work for you the year 'round on maintenance jobs, berm leveling, road planing, bull-dozing, snow plowing, brooming, mowing shoulders and as a patch roller. Good ideas on how to do all these jobs in Bulletin No. M-138. Write Huber Manufacturing Co., Dept. PW, Marion, Ohio.

Ditching for Water, Sewage and Drainage Lines

152. New bulletin describes the Buckeye Model 306 Utility Ditcher, and shows how rugged digging wheel quickly and economically cuts ditch 12" to 24" wide and up to 5½-ft. deep. For Bulletin 306 write Gar Wood Industries, Inc., Findlay Div., Findlay, Ohio.

Soil Conservation Challenge to Contractors

153. The role of industrial equipment and earthmoving contractors in the soil-saving operations of clearing woody growths, terrace building and grading is illustrated in new pamphlet, together with job details, costs and owner reports on tractor performance. Ask for Form A-456-M. International Harvester Co., 180 N. Michigan Ave., Chicago 1, Ill.

Data on New Single Stage Sludge Digestion Unit

163. High capacity mixing and ample gas storage space are provided in the new single stage digester type MA. Bulletin No. 6591 describes the unit and tells how it works. Photographs, drawings and useful tables of sizes and design data are included. Unit is available for tanks from 20 to 50 foot diameters. The Dorr Co., 570 Lexington Ave., New York, N. Y.

"How to Lay and Joint Vitrified Clay Pipe"

165. This manual on new techniques for speeding vitrified clay pipe sewer construction describes important developments in the hot-pour jointing compounds. Handy tables of quantities of jointing material required are also included. Copies from W. S. Dickey Clay Mfg. Co., 922 Walnut St., Kansas City, Mo. Ask for Bulletin 236.

What You Should Know About Meter Setting and Testing Equipment

166. Complete details on all equipment and proper methods for meter testing and installation are included in an excellent book published by Ford Meter Box Co., Wabash, Ind. All waterworks men concerned with setting and testing of water meters should have a copy of this book. Write for Catalog No. 50.

STREETS AND HIGHWAYS

Levels Sidewalks and Curbs Quickly and Easily

29. How the Mud-Jack Method for raising concrete curb, gutter, walls and streets solves problems of that kind quickly and economically without the usual cost of time-consuming reconstruction activities—a new bulletin by Koehring Company, 3026 W. Concordia Ave., Milwaukee 10, Wis.

Need Street, Sewer or Water Castings?

51. Street, sewer and water castings in various styles, sizes and weights. Manhole covers and steps, inlets and gratings, adjustable curb inlets, water meter covers, cistern and coal hole covers, gutter crossing plates, valve and lamphole covers, etc. Described in catalog PW issued by South Bend Foundry Co., South Bend 23, Ind.

Fast, Efficient Skid-Proofing

114. Get full facts about Baughman Light-Weight Cinder Spreaders, fast operators for cinders, sand, salt, chips, etc. Free flowing at low temperatures. 9-17 cu. yd. capacity. Write Baughman Mfg. Co., 1111 Shipman Road, Jerseyville, Ill.

How to Speed Curb and Gutter Work

126. Here's a 24-page bulletin illustrating form set-ups for every type of curb and gutter work. Send for Bulletin 2259 and learn how to speed up the job with Blaw-Knox Steel Street Forms. Write Blaw-Knox, Dept. PW, Farmers Bank Bldg., Pittsburgh 22, Pa.

Modern Sweeper Speeds Street Cleaning

162. The Austin-Western Model 40 sweeper features three wheel design, front wheel steer, for easy maneuvering; rear broom to sweep dirt and refuse directly into 2-yd. hopper; built-in flushing device. Diagrams showing all operations and full specifications in Bulletin AD-2042, issued by Austin-Western Co., Aurora, Ill.

Complete Bulletin on Municipal Supplies

178. Everything from leak locators to street signs is listed in the big bulletin on "Municipal Supplies" published by Darley. Hundreds of different items for all city departments are included in this handy booklet. Get a copy for ready reference on all municipal supplies. W. S. Darley & Co., 2814 Washington Blvd., Chicago 12, Ill.

SNOW FIGHTING

For High-Speed Snow Removal

44. "Frink One-Way Sno-Plows" is a four-page catalog illustrating and describing 5 models of One-Way Blade Type Sno-Plows for motor trucks from 1½ up to 8 tons capacity. Interchangeable with V Sno-Plow, Frink Sno-Plows, Inc., Clayton, 1000 Islands, N. Y.

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New Products, Pages 64-67:

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	12-9	12-10	12-11	12-12	12-13	12-14	

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Thrifty Salt Spreader for Snow and Ice Control

173. Check the Tarco "Scotchman" for fast, thrifty salt application to icy roads. Stainless steel spreader has weather-proofed engine. Get all data from Tarrant Mfg. Co., Jumel St., Saratoga Springs, N. Y.

Chemical Stops Salt Corrosion

174. A new chemical has been developed which, when mixed 1 pound to 100 pounds of salt, prevents any corrosion of automobiles by the salt. Harmless; colorless; odorless. Permits free use of salt for ice and snow control without complaint by drivers. Calgon, Inc., Pittsburgh, Pa.

End Dangerous Ice Hazards

179. Ice prevention on highways, streets and airport runways with Sterling "Auger Action" rock salt is described in illustrated bulletin PW issued by International Salt Co., Inc., Scranton, Pa.

SEWERAGE AND REFUSE

New Unit Cleans Catch Basins in a Jiffy

34. Simple powerful pneumatic bucket is featured by Netco Catch Basin Cleaner. Folder 33A gives details and illustrates operation of complete self powered truck mounted unit. Netco Div., Clark-Wilcox Co., 118 Western Ave., Boston 34, Mass.

Design Details for Sludge Collectors

42. Booklet No. P.W. 1982 on Link-Belt Circuline Collectors contains sanitary engineering data and design details. Catalog No. 1742 on Straightline Collectors, contains layout drawings, illustration pictures and capacity tables. Address Link-Belt Co., 2045 West Hunting Park Ave., Philadelphia 40, Pa.

A Handbook of Sewer Cleaning Equipment and Methods

46. A new, fully illustrated 40-page booklet shows every sewer cleaning operation with "Flexible" tools. Includes data on the fast and easily operated new SeweRodeR and full engineers' specifications for power bucket machines. For your copy write Flexible Sewer Rod Equipment Co., 9059 Venice Blvd., Los Angeles 34, Calif.

Furnace Data on Low Cost Incineration

49. The new furnace data bulletin issued by Nye gives information on six furnace sizes which may be used in single or multiple units, plus details of special features. Use coupon or write Nye Odorless Incinerator Co., 51 East 42nd St., New York 17, N. Y.

Engineering Facts About Transite Pipe

83. This compilation of Johns-Manville's "Engineering Facts" series presents concise, factual information about Transite's many economic and engineering advantages, and includes informative case histories plus dimensions and data for your files. Write Johns-Manville, Box 290, New York 16, N. Y., or use the handy coupon.

Odorless Sanitary Septic Tank Cleaning

88. The Gorman-Rupp Odorless Sanitary Cleaning unit combines centrifugal self-priming pump, air-cooled engine and oval tank on a sturdy frame. For full description of this adaptable unit get bulletin 7-ST-11. Gorman-Rupp Co., 120 N. Bowman Ave., Mansfield, Ohio.

How Cities Can Do Complete Sewer Cleaning From Street

98. Literature illustrating how cities, towns and villages using OK Champion Sewer Cleaners are doing a complete sewer cleaning job from street level. Power machines available in addition to full line of sewer rods and accessories. Issued by Champion Corporation, 4752 Sheffield Avenue, Hammond, Indiana.

Complete Catalog for Engineers Shows Sewage Plant Equipment

110. A complete, 44-page catalog gives engineering data on Jeffrey equipment for water, sewage and industrial waste treatment plants including screening, screenings grinders, grit collectors and washers, settling tank collectors, feeders, Floctrols, mixers and other mechanical equipment. Use coupon to get Catalog 775-A, Jeffrey Mfg. Co., Columbus 16, Ohio.

Underdrains—Hidden But Important Filter Components

113. For filter bottoms this firm makes "Armcre" vitrified salt glazed floor blocks which provide ducts occupying 50% of the floor cross-section and air openings aggregating over 24% of the floor area. Described in several leaflets and data sheets. Ayer-McCarel-Reagan Clay Co., Brazil, Ind.

Need Low-Cost Air For Sewage Treatment?

122. New 20-page booklet shows operating and construction features of Rotary Positive Blowers engineered to fit your needs. Air for activated sludge, water treatment; constant vacuum for filtering. Bulletin 22-23-B-13 gives details. Roots-Connersville Blower Corp., 310 Poplar Ave., Connersville, Ind.

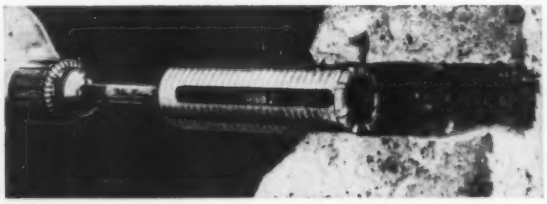
An Incinerator Necessity

139. Recuperators featuring silicon carbide heat transfer tubes and fireclay corebusters for maximum efficiency are described and illustrated in Bulletin 11 issued by Fitch Recuperator Co., Dept. PW, Plainfield Natl. Bank Bldg., Plainfield, N. J.

Conkey Filters for Sewage Sludge Disposal

180. Development of Conkey sludge filters and applications to all types of sewage sludge are described in Bulletin 100. Tables show filter sizes, weights, and give average anticipated results. Write General American Transportation Corp., Process Equip. Div., 10 East 49th St., New York 17, N. Y.

DRILL CONCRETE
2 to 6 INCHES PER MINUTE!



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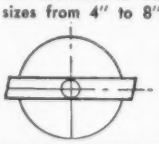
Up to 70% more efficient than pointed or solid drills. Leaves straighter, cleaner holes. Tilden Rotary Konkrete Kore Drill bits are available in sizes from ¼" to 4" diameter. Quotations on sizes from 4" to 8" will be made upon request.



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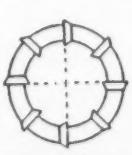

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Complete Sanitation and Process Equipment Bulletin

181. A complete, illustrated bulletin gives detailed information on all "Rex" sanitation and process equipment. 36 pages of engineering data, tables, conversion factors. Ask for Bulletin 48-41, Chain Belt Co., 1722 W. Bruce St., Milwaukee 4, Wisc.

Air for Activated Sludge and Other Aeration Processes

187. Quiet operation, high efficiency and compact size are features of the Chicago "Standardaire" positive displacement blower. Wide range of capacities available to fit your needs. Details and performance data from Chicago Pump Co., 2348 Wolfram Ave., Chicago 18, Ill.

POWER AND LIGHT

Dual Fuel Engines for Municipal Power

27. A new 8-page illustrated bulletin, No. 4811, describes Superior Dual Fuel Diesel engine operation and illustrates the simplicity of controls with fuel conversion by either push buttons or hand lever. Copies are available from Superior Engine Div., Dept. PW, The National Supply Co., Springfield, Ohio.

Air Cooled Engines for Hundreds of Applications

137. Tested under severest conditions of long, hard use, these engines have earned world wide recognition as the "right" power for hundreds of applications. Get latest bulletin from Dept. PW, Briggs and Stratton Corp., Milwaukee 1, Wisc.

Low Cost Power From Dual Fuel Engines

154. Operating on the Diesel cycle, burning either oil or gas, the Worthington Supercharged Dual Fuel Diesels give high economies by running on the cheapest fuel available. Get complete data from Worthington Pump & Machinery Corp., Dept. PW, Harrison, N. J.

USE COUPON ON PAGE 69 *TODAY* TO ORDER THE LITERATURE YOU NEED.

Using Sewage Sludge Gas for Power Generation

160. The Fairbanks-Morse Diesel and Dual Fuel Engine, Model 31A can operate on either sludge gas or oil to supply steady power output despite fluctuations in gas production. Detailed spread shows passage of fuel, air, oil and water on cutaway section. Get Bulletin 3100 AG31 from Fairbanks, Morse & Co., 600 So. Michigan Ave., Chicago 5, Ill.

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Data Book on Universal Concrete Cribbing

21. Shows typical sections for designing walls, pictures many applications, specifications, etc. Get the facts today about this economical reinforced concrete cribbing. Universal Concrete Pipe Co., Dept. PW, 297 So. High St., Columbus 15, Ohio.

Solve Your Drainage Problems This Easy, Permanent Way

28. Useful new 60 page catalog on standard corrugated pipe, multi-plate pipe and arches and 18 other drainage and related products for culverts, sewers, subdrains, flood control, airports, water supply and other types of construction. Ask for "Armco Products for Engineering Construction," Armco Drainage and Metal Products, Inc., Dept. PW, Middletown, Ohio.

Methods of Installing Steel Sheet Piling

30. Illustrated descriptions of both standard and interlock corrugated steel sheet piling of minimum weight, maximum strength, ease of handling with methods of installation are contained in a booklet. If you have a job involving piling write Caine Corr-Plate Piling Co., Dept. PW, 2535 S. State St., Chicago 16, Ill.

Shovel or Load With The Dempster Diggster

45. Automotive Hydra-Shovel digs 15 ft. above, 15 in. below grade, features independent hydraulic hoist and crowd action. Capacities 1 cu. yd. for digging solid earth, 1¼, 1½ and 2 cu. yd. for loading all types material. Get information from Dempster Brothers, Inc., 949 Dempster Bldg., Knoxville 17, Tenn.

Speed Your Work With These Powerful Motor Graders

48. Two powerful Gallon motor graders designed to answer every requirement for more speed in road, airport, dam and housing construction work are fully described in a folder illustrated with many action pictures. Issued by Gallon Iron Works & Mfg. Co., Galion, Ohio.

How to Keep Your Loader On the Job

50. Don't take more time to move your loader to the job than to do the work. Investigate the Eagle Truck Mounted Loader for handling gravel, sand, cinders, snow from windrows or piles. Get forms 444 and 947 from Eagle Crusher Co., Inc., Galion, Ohio.

Data and Pictures of Complete Line of New Ford Trucks

58. Check this number on the coupon for colorful circular showing new Ford Trucks for every hauling need, available in great variety of standard, factory-built

THE GOLDAK *Featherweight* MODEL 87

PIPE LOCATOR

FINDS THOSE PIPES!

- Gives EXACT location of buried pipes, mains, services, tees, ells, stubs, etc.
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Please send information on how the Improved OK Champion Power Sewer Cleaner cuts sewer cleaning costs.

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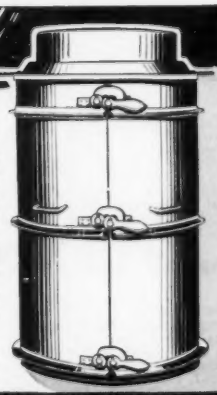
THE "Quinn Standard"
FOR CONCRETE PIPE



The Quinn Standard is known as the best the world over, wherever concrete pipe is produced and used. Backed by over 35 years' service in the hands of hundreds of Quinn-educated contractors, municipal departments and pipe manufacturers who know from experience that **Quinn pipe forms** and **Quinn mixing formulas** combine to produce the finest concrete pipe at lowest cost.

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For making pipe by hand methods by either the wet or semi-dry processes. Built to give more years of service—sizes for pipe from 10" up to 120" and larger—tongue and groove or bell end pipe at lowest cost.

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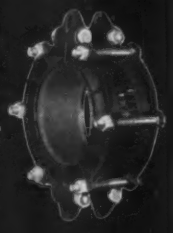

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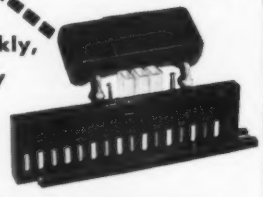

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The ideal instrument for determining the free or residual chlorine content of water, sewage or industrial wastes.

Taylor-Enslow slides are molded of durable plastic and contain a complete set of 9 sealed color standards. Two slides are available: 0.0 to 1.0 p.p.m. and 0.0 to 3.0 p.p.m. of chlorine. All Taylor liquid color standards carry an unlimited guarantee against fading. Combination pH and Chlorine sets, and complete Taylor Water Analyzer sets are also available. All sets are easily portable.

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chassis and body combinations. Be sure to check these trucks on your job. Truck and Fleet Sales Dept., Ford Motor Co., Dearborn, Mich.

Dependable Self-Priming Pumps

68. Sterling centrifugal self-priming pumps are available in 1½" to 8" models, rated by A.G.C. standards. Get Pump Bulletin AGC-1 giving capacities over wide range of head. Data on wheel mounted units, belt and electric motor driven pumps. Sterling Machinery Corp., 405 Southwest Ave., Kansas City 10, Mo.

Easily Portable Pump Has Many Uses

70. A new bulletin (LP-9) describes the Jaeger "Bantam" sure-prime portable pump. The lightweight unit pumps up to 5700 gph; a larger portable model has capacity up to 9000 gph. Be sure to check this handy unit, invaluable for all light drainage work. Write Jaeger Machine Co., Columbus 16, Ohio.

Tractors for Counties, Cities and Contractors

76. An attractive 24-page catalog portrays the Allis-Chalmers HD-5 crawler's abundant capacity and ability to meet the variable needs of counties, townships and contractors. Photographs and cutaway views illustrate its rugged construction and simplified maintenance. Use coupon or write Allis-Chalmers Mfg. Co., Tractor Division, Milwaukee 1, Wisc.

Is Your City Metered 100%?

33. 100% metering as practiced by many cities requires accurate, dependable meters with interchangeable parts. Cutaway views of every part, capacity and size data are all included in handsome American-Niagara water meter booklet available from Buffalo Meter Co., 2920 Main St., Buffalo 14, N. Y.

Data on Modern, High-Rate Water Treatment Plant

40. This handsome 28-page bulletin gives a comprehensive yet understandably written story of the development of the Accelator, and explains its principles, advantages, design considerations, operation and applications. Helpful flow diagrams and specifications. For a copy use the coupon or write Infilco Inc., 325 W. 25th Place, Chicago 16, Ill. Ask for Bulletin 1825.

Solve Corrosion Problems With This Special Alloy

41. "Everdur Metal" is title of an 8-page illustrated booklet describing advantages of this corrosion-resisting alloy for sewage treatment equipment, reservoir, and waterworks service. Dept. P.W., the American Brass Co., 25 Broadway, N. Y. C.

Eliminate Taste and Odor From Your Water

53. Technical pub. No. P.W. 213 issued by Wallace & Tiernan Co., Inc., Newark, 1, N. J., describes in detail taste and odor control of water with Break-Point Chlorination. Sent free to any operator requesting it.

All of These Booklets Are FREE, and Many Are of Great Value. To Order Those You Need in Your Work Use the Coupon on Page 69.

Drill Concrete With Your Ordinary Electric Drill

82. Substantial cost-per-hole savings are claimed for Tilden Rotary Drills which penetrate concrete 2" to 4" per minute. Cutters can be resharpened. Available in sizes ¼" to 4". Get full data from Tilden Tool Mfg. Co., 1995 N. Fair Oaks Ave., Pasadena 3, Calif.

Keep That Trench Pumped Really Dry!

93. To find out how well a Homelite Carryable Pump handles large volumes, seepage, mud, write today for illustrated bulletin L-503 containing data of great value to all pump users. Write Dept. PW, Homelite Corp., 2110 Riverdale Ave., Port Chester, N. Y.

How to Get Accurate Subsurface Information

172. For positive knowledge of subsurface soil conditions an accurate sample is needed. The compact and complete Acker Soil Sampling Kit includes 12 soil and earth sampling tools. Get details in Bulletin 26. Acker Drill Co., Inc., Dept. PW, Scranton 3, Pa.

WATER WORKS

What You Should Know About Hypochlorination

20. This really helpful booklet tells you a lot about hypochlorination of water for small and medium sized supplies, swimming pools and main sterilization, and fully describes the application of manual and automatic "Chem-O-Feeders" for constant or proportional feeding of chemicals. Send for Bulletin SAN-8 issued by Proportioneers, Inc., 96 Codding St., Providence 1, R. I.

Makes Underground Pipe Installations Easy

25. One-man operated Hydraulic Pipe Pusher pushes pipe through ground under streets, sidewalks, lawns and other obstacles. Pays for itself in man hours saved on first few jobs. For complete facts and prices, ask for booklet S-117, Greenlee Tool Co., 2050 Columbia Ave., Rockford, Ill.

Helpful Data on Hydrants

64. Specifications for standard AWWA fire hydrants with helpful instructions for ordering, installing, repairing, lengthening and using. Issued by M. & H. Valve & Fittings Co., Dept. P.W., Anniston, Ala.

Cast Iron Pipe and Fittings For Every Need

65. Cast iron pipe and fittings for water, gas, sewer and industrial service. Super-deLavaud centrifugally-cast and pit-cast pipe. Bell-and-spigot, U. S. Joint, flanged or flexible joints can be furnished to suit requirements. Write U. S. Pipe and Foundry Co., Dept. PW, Burlington, N. J.

Recording Meters for Parabolic Flumes

73. Engineering data on parabolic flumes and accurate companion meters for open flow water and sewage metering is given in Simplex bulletin 210. Installation data and calibration included. Write Simplex Valve and Meter Co., Dept. 4, 6750 Upland St., Philadelphia 42, Pa.

All Electric Floatless Liquid Level Control

78. Description of operating principles and applications of B/W controls shows the simplicity and many uses of these all-electric, floatless devices. Diagrams of typical installations and engineering data all in bulletin 147 issued by B/W Controller Corp., Dept. PW, Birmingham, Mich.

Speedier, Space-Saving Purification Apparatus

81. A new 12-page bulletin, No. 2204, tells how the Spaulding Precipitator, in removing impurities from a liquid by precipitation, adsorption, settling, and upward filtration, occupies less space, uses less chemicals and speeds up treatment. Permutit Co., 330 West 42nd St., New York 18, N. Y.

How to Estimate Quantity Of Joint Compound Needed

87. The uses of Tegul-Mineralead for bell and spigot pipe and G-K Sewer joint compound are described in bulletins issued by Atlas Mineral Products Co., Mertztown, Pa. Includes useful tables for estimating quantities needed.

Flow Meters With Many New Features

91. The new Propelflo meter for main-line metering introduces many new features you will want to look into. Send for latest bulletin today. Builders Providence, Inc., 16 Codding St., Providence 1, R. I.

Be Sure to Investigate the "Spiralflo" Clarifier Design

92. Be sure you have information on the new Yeomans Spiralflo clarifier, adaptable to either water or sewage plants. 8-page bulletin explains operation of unit, gives plans, specifications and results of actual installations. Write for bulletin 6790, Yeomans Brothers Co., 1411 No. Dayton St., Chicago 22, Ill.

Cast Iron Pipe Handbook— Handy Pocket Size

97. Catalog of Universal Cast Iron Pipe and Fittings, pocket size, illustrated, including useful reference tables and data. Sent by The Central Foundry Co., Dept. P.W., 386 Fourth Ave., New York 16, N. Y.

How Elevated Water Tanks Can Save on Operating Costs

134. Beautiful new booklet on Horton elevated steel water tanks suggests ways to reduce pumping costs, increase capacity of systems, maintain uniform pressure, etc. Illustrates 7 models of welded, ellipsoidal-bottom, elevated steel tanks in full color. Write Chicago Bridge & Iron Co., 2115 McCormick Bldg., Chicago 4, Ill.

Well Water Systems Built to Last

105. Layne pumps are built for wells ranging from 4" to 36" diameter and in capacities from 50 to 16,000 gpm. Full engineering data and many installation views are given in 32 page Pump Bulletin 4-42. Layne and Bowler, Inc., Memphis, Tenn.

Pressure Pipe That Retains Capacity

106. Several bulletins describing the construction of pressure pipe, list of installations, carrying capacity tests, making service connections under pressure; and detail descriptions of several installations. Lock Joint Pipe Co., Box 269, East Orange, N. J.

How About Centrifugal Pumps?

108. Centrifugal Pumps of various designs—single-stage, double-suction, split casing; single-stage single-suction; two-stage opposed impeller; three-stage; high-pressure; fire pumps; close-coupled. A bulletin for each type. Write to Dept. P.W., Peerless Pump Div., Food Machinery and Chemical Corp., 301 W. Ave. 26, Los Angeles 31, Calif.

Handy Catalog Describes Small Hydrants, Drinking Fountains

115. This 32-page catalog describes ¾" to 2" hydrants. Also street washers, drinking fountains and other water service devices. The Murdock Mfg. & Supply Co., 426 Plum Street, Cincinnati 2, Ohio.

Do You Ever Have Leaks to Fix?

124. You'll want to know about the full line of "Skinner-Seal" clamps for repairing bell and socket joint leaks and broken mains. Step-by-step procedures are illustrated in catalog 41, a handsome 40-page presentation which shows applications of all fittings. Write M. B. Skinner Co., Dept PW, South Bend 21, Ind.

Specs for Gate Valves

112. Rigidly inspected gate valves for pressures up to 175 lbs. by R. D. Wood Co. Sizes 2" to 30"; for any standard type joint. R. D. Wood Co., Public Ledger Bldg., Philadelphia 5, Pa.

All About Cement-Mortar Lining of Water Mains

133. Here, in a really beautiful booklet, is practically everything you need to know about this method of lining mains in place—the needs, methods, and results that will interest you. Centriline Corp., Dept. PW, 140 Cedar St., New York 6, N. Y.

Here's Data on All Swimming Pool Needs

135. Well illustrated bulletin describes filters, water softeners, hydrogen ion plants, chlorine feeders and complete equipment for swimming pools, etc. Copy sent on request by Dept. PW, Chemical Equipment Co., 223 Center St., Los Angeles 54, Calif.

"Tailor-Made" Pumps Fit Your Requirements

156. Application-Engineered vertical turbine pumps to suit your particular pumping requirements are completely described in Bulletin P-178. Details of optional driving and pumping arrangements clearly illustrated. Get your copy from A. O. Smith Corporation, Dept. PW, Milwaukee 1, Wisc.

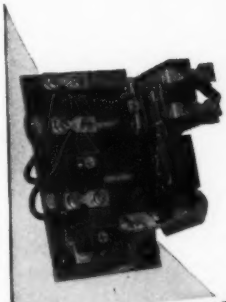
Continuous Operation Trojan Pipe Pusher

175. New, larger pipe pusher and puller handles pipe up to 2", has three pushing speeds. Fittings handle lead and copper pipe too. Get full details showing how to speed up water service installations. Write Trojan Mfg. Co., 441 E. Water Street, Troy, Ohio.

B/W

All Electric Floatless...

LIQUID LEVEL CONTROLS



Control variations in levels from ¼" upward. Remote control if desired — any distance. Controls unaffected by acids, caustics, pressures or temperatures.

Since 1933 B/W Controls have provided positive, dependable, economical liquid level control. No floats! No vacuum tubes! No moving parts in liquid.

WRITE FOR CATALOG

B/W CONTROLLER CORPORATION

2224 E. Maple Road
Birmingham, Michigan

FIRST and FOREMOST IN THE FLOATLESS CONTROL FIELD

4 days' work now done in 3

JAEGER MODEL 125 obsoletes the 105,

Runs 2 heavy or 3 medium breakers at full 90 lbs. pressure instead of 70, increases production 30% to 40% with the same men and tools.

All new Jaeger sizes—75 to 600 ft.—give comparable work increases.

See your Jaeger distributor or ask for Catalog JC-8

The JAEGER MACHINE CO.
Columbus 16, Ohio

PUMPS • MIXERS • HOISTS
PAVING EQUIPMENT

97 YEARS

Only three years more and our Company will be one hundred years of age.

When our forbears started this business they made the best damn water service devices that could be designed and manufactured.

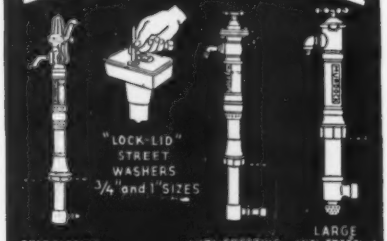
We follow in their footsteps. We're making the best damn Outdoor Drinking Fountains, Hydrants and Hose Boxes that can possibly be made.

Specify MURDOCK!

The Murdock Mfg. & Supply Co.

Cincinnati 2, Ohio

MURDOCK



SELF-CLOSING ANTI-FREEZING HYDRANT

ANTI-FREEZING COMPRESSION HYDRANT

LARGE ANTI-FREEZING HYDRANTS 1½" TO 2" INCLUSIVE

FOR BETTER

pH Control and WATER TESTS

there is nothing like

NON-FADING GLASS COLOR STANDARDS

Pocket Comparator No. 605

Permanent reliability of Hellige Glass Color Standards, accuracy of color comparison, simplicity of technique, and compactness of the apparatus are exclusive features of Hellige Comparators.

WRITE FOR BULLETIN No. 602

HELLIGE

INCORPORATED

3718 NORTHERN BLVD. LONG ISLAND CITY 1, N.Y.

HEADQUARTERS FOR COLORIMETRIC APPARATUS

WORTH TELLING. . . . By Arthur K. Akers

Chester P. Gabosch is the new sales manager of **M. & H. Valve and Fittings Company,** Anniston, Ala., succeeding J. W. Spradley, deceased. Mr. Gabosch, long in the valve and fittings business, has been sales manager of Jarecki Manufacturing Company, Erie, Pa.

•

Expanded operations of **Graver Water Conditioning Company** include appointment of **Henry T. Sulcer** as general manager, in New York, assisted by **Edward W. Welp,** in Chicago. New branches are in Cleveland and Philadelphia.

Mr. Sulcer

Mr. Mandt

O. G. Mandt heads the new **Mandt Manufacturing Company,** Columbus, Ohio, to make and market the Mandt swing loader, a hydraulically operated material loader with 180° swing and many uses.

•

Marvin Kanouse takes over as sales manager for **Novo Engine Company,** Lansing, Mich., succeeding J. F. Chapman. Mr. Kanouse comes from Reo Motors.

•

Dravo Corporation, Pittsburgh, has been awarded the contract to install 14 large DeLaval pumping units at Nottingham Pumping Station, Cleveland.

•

H. "Red" Gottwald, who has been concentrating on South American affairs for the **Nordstrom Valve Division,** Rockwell Manufacturing Company, moves up to assistant sales manager, with headquarters at Pittsburgh.

•

Portland Cement Association, Chicago 10, announces appointment of **Miles D. Catton** as director of development. The Association has also opened its twenty-sixth district office, in Salt Lake City under **Edgar B. Wilson,** district engineer in charge. **G. Donald Kennedy** will become consulting engineer and assistant to President **Frank T. Sheets** on January 1, 1950.

The picture below is *not* a pipe organ. It is of the very artistic and striking display of **W. S. Dickey Clay Manufacturing Company's** clay pipe at the recent A.P.W.A. meeting in Kansas City.

Dickey display at APWA

Wm. E. Madden has been named general sales manager for the **George Haiss Mfg. Co.,** New York, a division of the Pettibone Mulliken Corporation, Chicago.

•

caine CORR-PLATE Piling Company is the new name of these manufacturers of steel piling, at 2535 South State Street, Chicago. **Irving W. Caine, Harmon L. Caine,** and **Arthur B. Mayer** head the new organization which offers prompt shipments from stock.

•

Carl Loud, general sales manager, **Federal Motor Truck Company,** just back from a nationwide field survey, predicts demand for over 100,000 new trucks in connection with four billion dollars of road building commitments in 1950.

Mr. Hames

Mr. Loud

Joe R. Hames is now southwestern representative, in Dallas, of **Contractors Machinery Company,** Batavia, N. Y. In sending this news **Edith White,** advertising manager of Contractors, adds that she reads this column—further evidence of her excellent literary taste!

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